Topic:TH-D

Blob Transport Models and Analysis of 2D Imaging Experiments*†

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Blobs are intermittent filamentary convecting objects that are believed to dominate radial transport in the tokamak scrape-off-layer. The theory of curvature-driven blob transport regimes in a tokamak is developed and employed to make testable predictions for the magnitude and scaling of the blob radial velocity v_x. The theory encompasses the sheath-connected, resistive X-point and resistive-ballooning-disconnected regimes. Gas puff imaging (GPI), a fast-time-scale high-spatial-resolution imaging technique, presents a new opportunity, investigated here, for the comparison of blob theory with 2D data. First, the atomic and neutral physics aspects of interpreting GPI images are studied. It is shown that the single state collisional radiative CR model is able to resolve time variations slower than 1 μs and is, thus, suitable for present GPI experiments. Simulated and time-averaged emission clouds are compared. Finally, we report on the analysis of the experimentally observed blob velocity, and its interpretation in term of blob models. We find that the observed velocity is bounded by theoretically predicted minimum and maximum velocities corresponding to the sheath-connected and resistive-ballooning-disconnected limits respectively. It is also shown that the blob birth zone is near the local maximum of the edge logarithmic pressure gradient, suggesting blob generation by an underlying edge instability.

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