Double imaging with Intensified Visible Fast Camera to visualize the fine structure of turbulent coherent plasma structures (Blobs)

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A visible fast camera coupled with an image intensifier was employed to view turbulent coherent plasma structures (Blobs) at the gas plume being puffed through a poloidal limiter. The image intensifier amplifies the light intensity thereby allowing the imaging system to be operated at ultra-short exposure times down to 100 ns. The idea behind operating at such low exposure times is to study the features of the turbulent coherent structure features at smaller time scales as is usually done. Possible effects that can distort the Blob's characteristics if the camera exposure time is larger than its dynamics are the smoothing effect (averaging of multiple events within the integration time) or the blurring effect (integrating the emission in time during the movement of the Blob). This can be especially important when looking for space scales below 1 cm, what we call the fine structure. The image intensifier however introduces some grainy noise to the camera image and in the fine structure analysis this noise can sometimes become comparable to the size of the structure itself and may lead to a false interpretation of the image. To distinguish real physical signal from noise we get two simultaneous images with the same view and compare them. We call this Double Imaging technique and it allowed us to validate the detected blob shape to scales down to a few millimetres, limited by our optical resolution. We have studied the influence of camera exposure time on the blob features and observed that for shorter times more intense bursts are recorded. The most intense bursts are smoothed, even using an exposure time of 1 microsecond. Further, for the low-density Electron Cyclotron Resonance Heated (ECRH) plasmas analysed, the detected structures with positive density above the background (Blobs) show strong intensity excursions not visible in the negative structures (Holes), these however being more numerous at the low-intermediate intensity range. Other results concerning Blob characteristics are shown.