Studies of Ion Transport through Laser Injected Impurities at the Edge in TJ-II Plasmas

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A new technique for the study of the thermalization of injected impurities at the edge of a hot plasma, under no perturbative conditions, is presented. Contrary to conventional sub-Doppler spectroscopy, requiring a high spectral resolution detector, the technique uses filter-scope detectors and a trade between spectral and time resolution is performed. It is complementary to the previously described He beam technique used for ion temperature profile characterization in TJ-II [1].

In the proposed technique, a NdYag Laser is used to ablate Li from the lithiated wall in TJ-II. Laser Induced Breakdown Spectroscopy (LIBS) provides information about the species released into the plasma [2] as well as defining a time reference for the Time of Flight measurements of LiII ions performed at several toroidal distances from the laser source. Flight times of tens of microseconds are recorded and the shape of the arriving pulse is deconvoluted to extract the energy distribution achieved by the light ion during its thermalization with the background plasma as well as characterizing non-diffusive transport mechanisms as plasma rotation.

In this presentation, examples of the use of the technique for studies of edge ion temperature profiles as well as plasma rotation and residence time of non-recycling impurities [3] will be given. Basic aspects of the new technique and possible upgrades and shortcomings will be also addressed.

