

Exploitation of Thomson Scattering at the outboard edge in MAST

Rory Scannell¹ Dave M Hare², P.G. Carolan, D. Muir, S. Prunty¹, M.J. Walsh
EURATOM/UKAEA Fusion Association, Culham Science Centre, Abingdon, Oxfordshire,
OX14 3DB, UK

The MAST Thomson scattering system has a spatial resolution varying between 2-4cm at 19 spatial points across the plasma, which is currently being upgraded to attempt to better resolve edge electron temperature and density pedestals. Gradients of these are critical for measurement of plasma transport parameters and better understanding of ELMs.

The low temperature in the pedestal region causes problems due to low spectral broadening, which may be counteracted by a large scattering angle. Observation of the finite size laser beam at such an oblique scattering angle requires careful consideration of the geometry. The overall performance of the system in terms of minimum measurable pedestal width and errors in electron temperature and density will be considered and illustrated.

Typically edge models are fitted to temperature and density profiles, where the temperature and densities have been determined from fitting independently to the spectra received from individual spatial points. An integrated fitting technique has been developed for fitting a pedestal model to these edge profiles by considering the received spectral data collectively. A spatial convolution of data by collection optics is taken into account, and is particularly important in the gradient region, since the mean temperature of a spatial point would otherwise be weighted toward the high density region. This new integrated technique is inherently better for fitting, it produces directly the model parameters and makes use of previously unresolved spatial points. Equally this technique is applicable to other diagnostics which fit individual spatial points in an uncorrelated fashion.

This work is funded jointly by the UK Engineering and Physical Sciences Research Council and EURATOM.

¹Dept of Electrical Engineering, Association EURATOM-DCU, University College Cork, Ireland

²University of Bath