Mode localization using Lithium beam emission spectroscopy on the EAST tokamak

B. Tal1, A. Diallo2, S. Zoletnik1, G.H. Hu3, G.S. Xu3, R. Maingi2
and the EUROfusion MST1 Team4

1 Wigner Research Centre for Physics, P.O. Box 49, H - 1525 Budapest, Hungary
2 Princeton Plasma Physics Laboratory, Princeton, NJ 08543-0451
3 Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, Anhui 230031, China
4 See the author list in H. Meyer et al., Nuclear Fusion FEC 2016 Special Issue (2017)

The Lithium beam emission spectroscopy (LiBES) diagnostic injects accelerated Lithium atoms to the plasma. They may be excited or ionized at the SOL-edge region. The excited states decay, which process is accompanied by emission of photons at around 670.8 nm wavelength. From the spatial distribution of this light plasma density can be deduced [1]. Additionally, perturbations in the density modulate the level of detected light which allows one to study coherent and quasicoherent modes at the outer region of the plasma.

Since light response is nonlocal to density modulation the localization of oscillations require reconstruction of density on fast timescales [2]. This is especially true in the vicinity of the light profile peak, which is often around the top of the density pedestal. The advantage of this technique is the accurate localization of the modes relative to the average profiles since the same data series is used for calculating both quantities.

The method is applied on the EAST tokamak where several modes are observed with the LiBES system in the different plasma scenarios spreading from some kHz to a few hundred kHz. The sensitivity region of that system partly overlaps with reflectometry allowing the comparison with those observations [3] from the aspect of frequency and position. Additionally, similar phenomena has also been investigated with reciprocating probes [4, 5]. The observations introduced in this study can be later compared to measurements done in MST1 devices.

References