BULGARIAN ACADEMY OF SCIENCES
INSTITUTE OF ELECTRONICS
"Acad. Emil Djakov"

Improving the resolution of Thomson scattering LIDARs by application of novel deconvolution – based algorithms

Project in the frame of 7th Framework Programme of the European Atomic Energy Community (EURATOM)
No. FU07-CT-2007-00059

Research team

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Collaborators - JET-EFDA, Culham Science Centre, OX14 3DB, Abingdon, UK

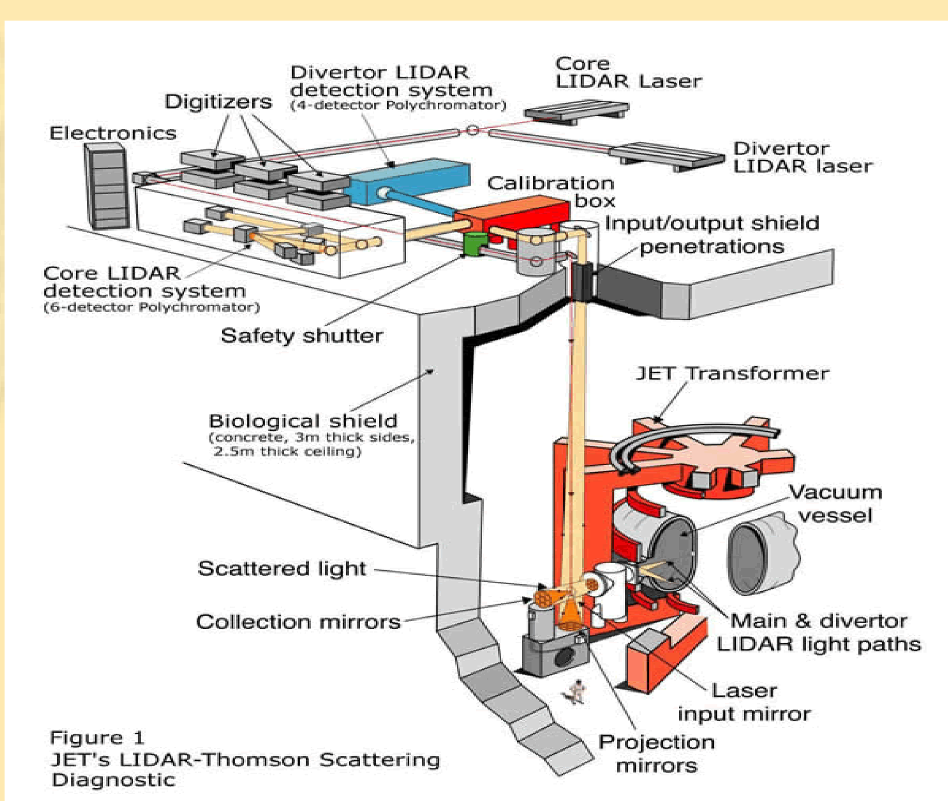
BASIC RESULTS

* Novel flexible approaches have been developed to the determination of the electron temperature profiles in fusion plasma by Thomson scattering lidar system. Their feasibilities have been proved by profound and detailed computer simulations and processing of real JET TS core LIDAR data

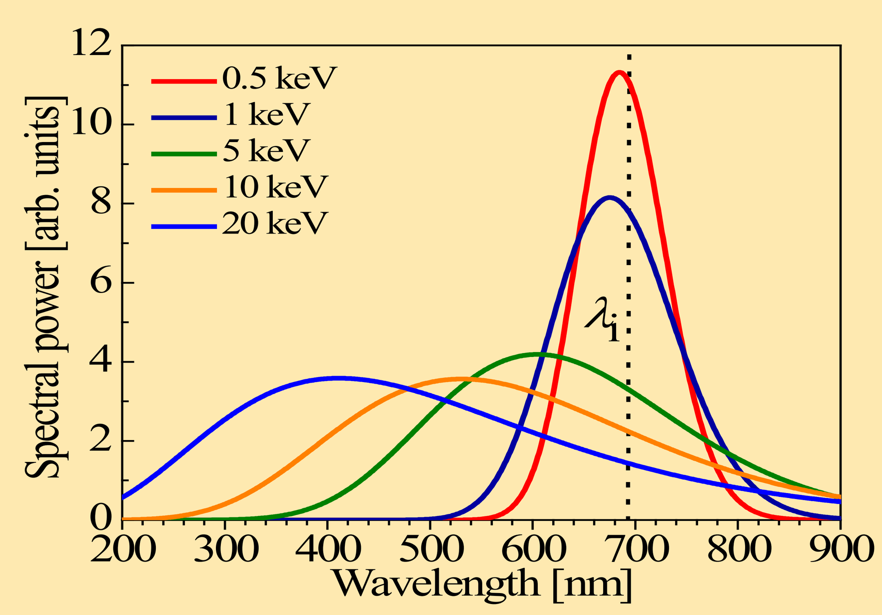
* Effective deconvolution techniques have been developed and investigated for improving the range resolution of the JET core LIDAR profiles, and thus the resolution of retrieving the electron temperature and density profiles.

* A novel method has been developed and tested by using real JET Core LIDAR data for retrieving the true electron temperature pedestal in the thermonuclear plasma.

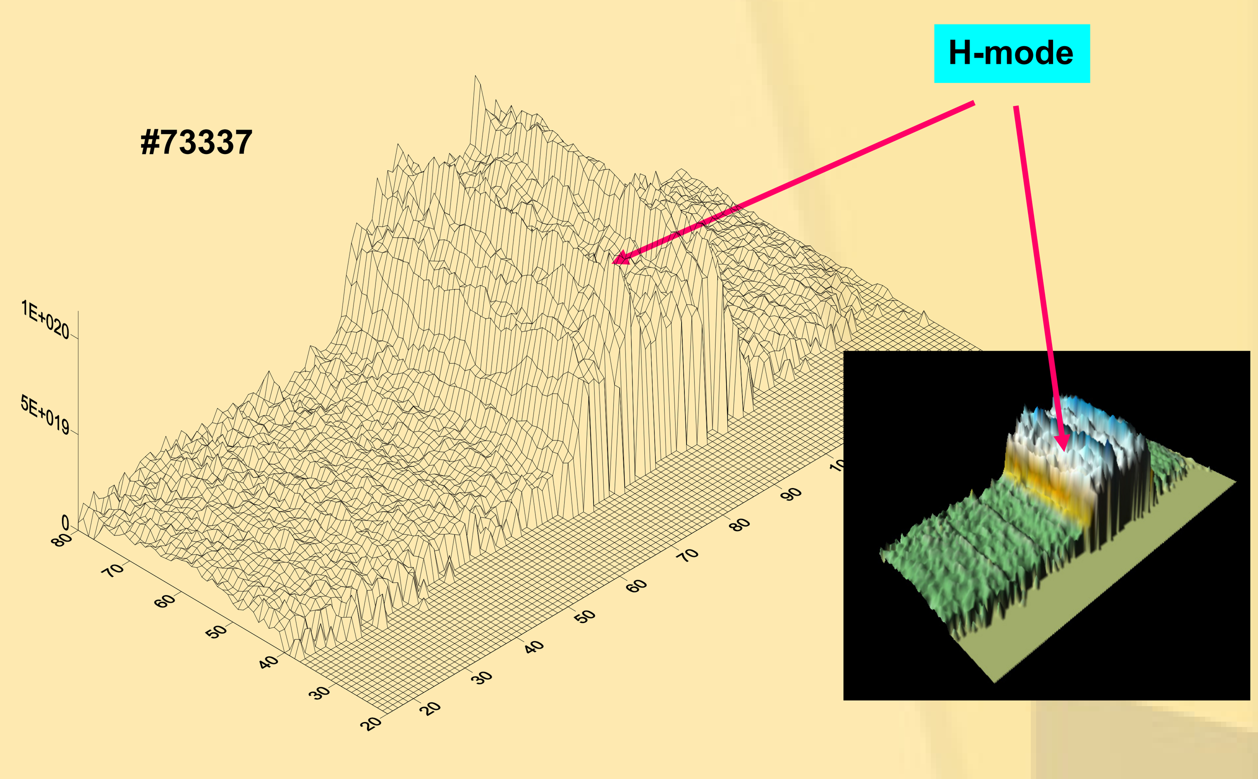
* A special software analysis code has been developed and tested for loading, calibration and processing of raw JET Thomson scattering core LIDAR data on the basis of the program language IDL.



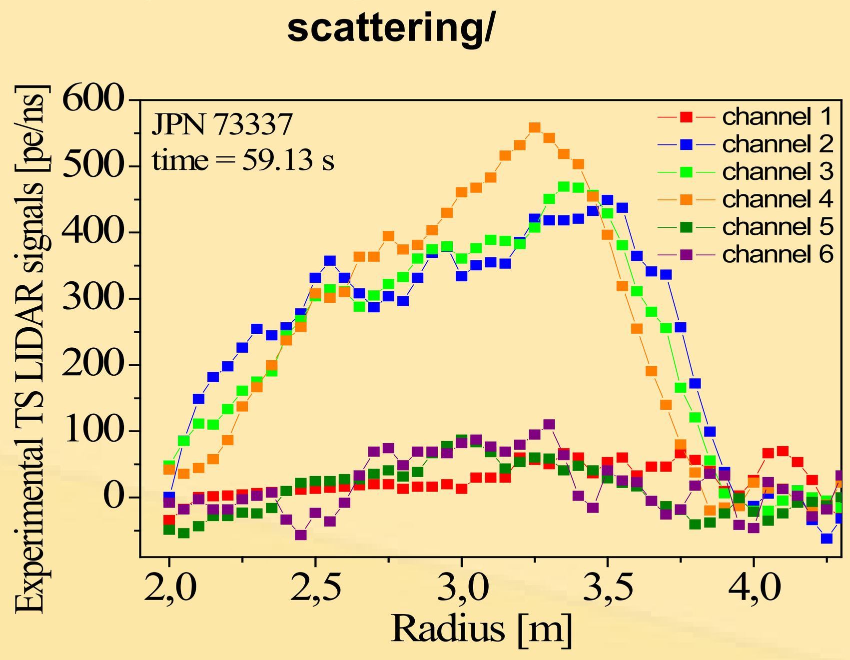
http://www.jet.efda.org/focus-on/lidar-thomson-scattering/



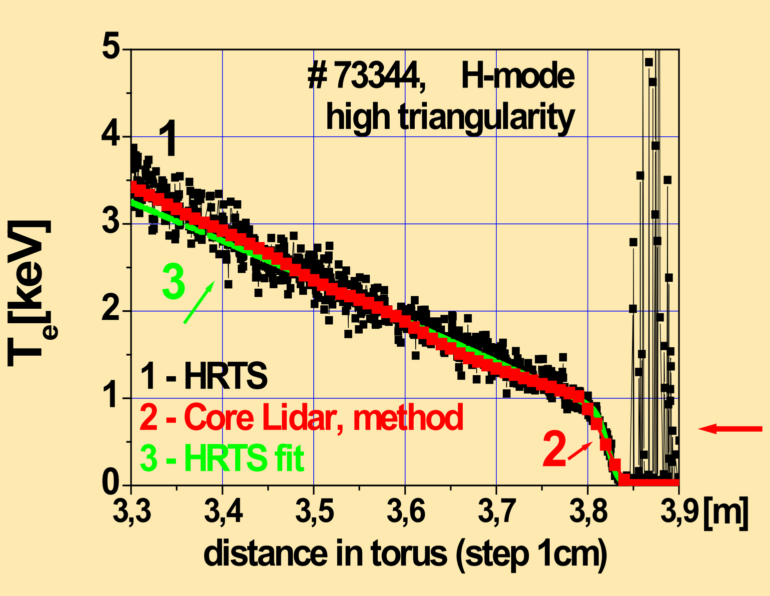
Relativistic Thomson backscattering spectrum for different electron temperatures at λ_i =694 nm

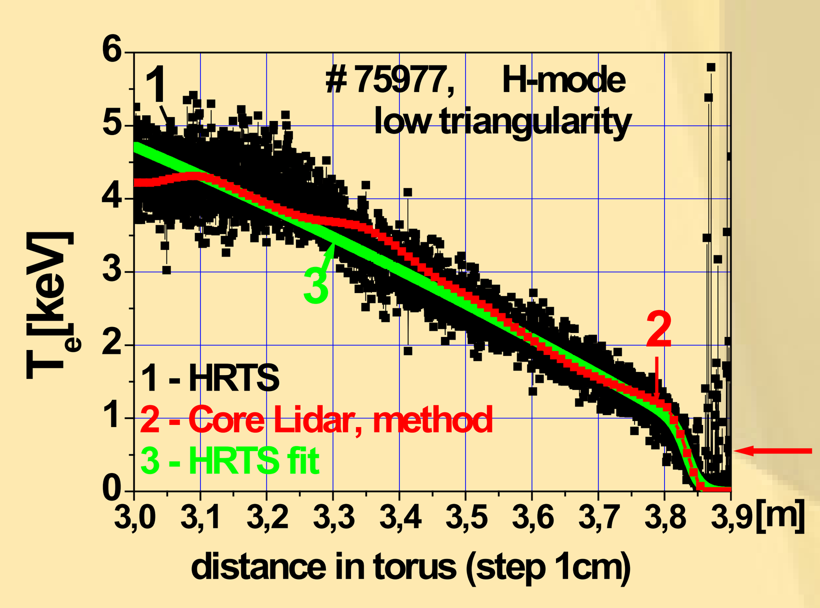


Deconvolved electron density profiles ~ 140 profiles

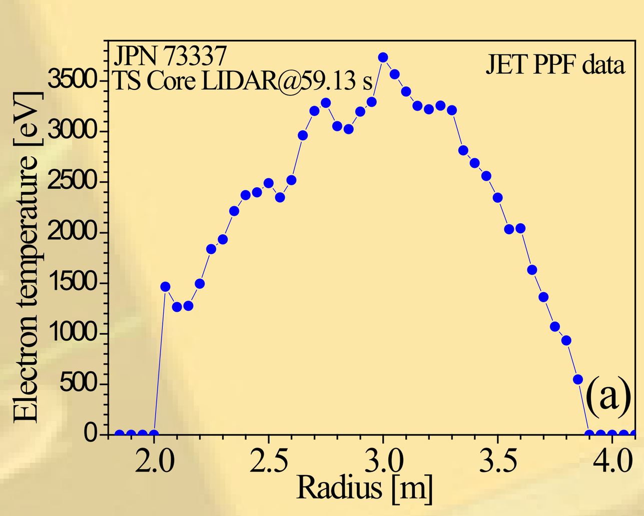


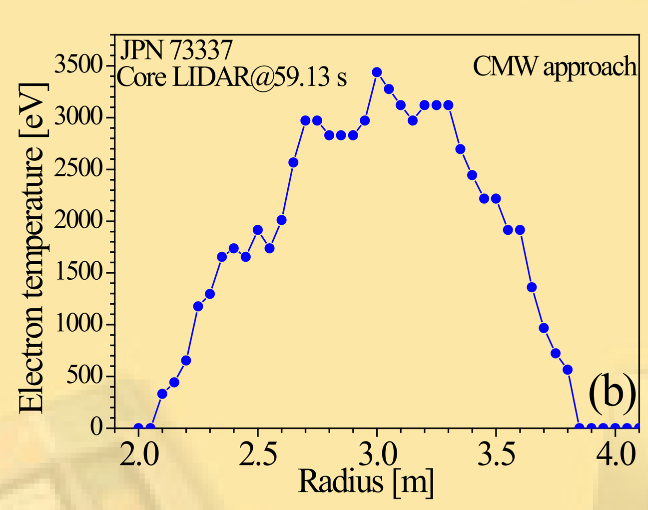
Experimentally obtained LIDAR profiles for the six JET spectral channels



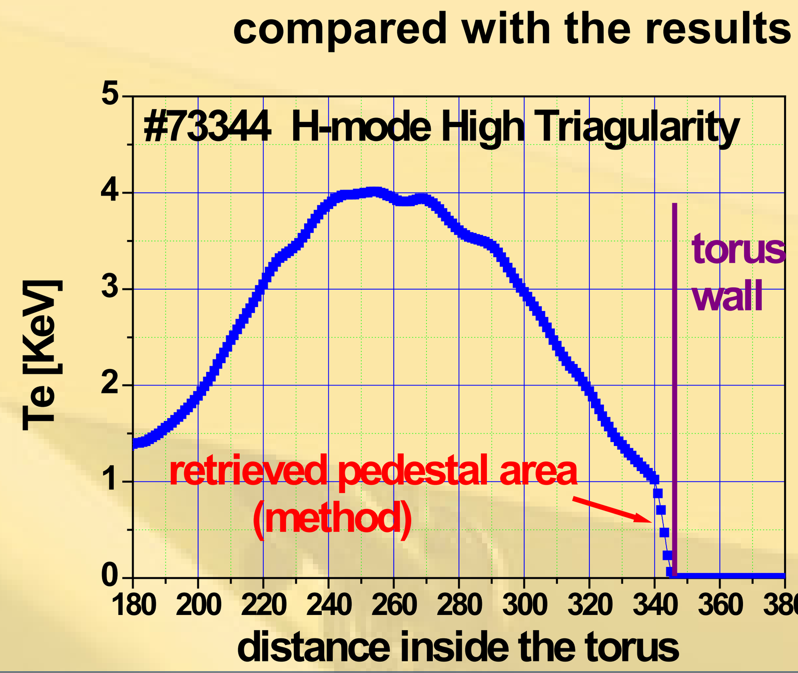


Retrieved electron temperature pedestal shape (step 1cm) near the torus wall (red curves) for high- (left) and low- (right) triangularity plasma compared with the results obtained by HRTS instrument





Electron temperature profiles determined using the fitting approach on JET (a) and CMW approach (b)



Full JET electron temperature profile (step 1cm) with resolved pedestal, retrieved from the JET Core Lidar data (step 3cm)

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