The core Thomson scattering (TS) diagnostic is used to study profiles of the electron temperature and density in this core plasma region on the Alcator C-Mod tokamak (R: 56 cm, a: 23 cm). This system uses two Nd:YAG lasers sharing the same path and operating in a 1.2/3 Hz regime, giving 1 ms time resolution. The diagnostic has 11 spatial channels and can have down to 1 cm resolution in the region of the internal transport barrier (ITB) foot. Results of the profile measurements are presented as well as comparisons with T95 measurements from other diagnostics. ITBs are observed from the density peaking profiles. For transport analysis purpose fitting density data with a smooth function is required. For ITB cases ‘double-bump’ functions is introduced. Analysis of TS and VB data enables us to obtain time dependent Zr profiles in different plasma regimes and to make quantitative analysis of impurity accumulation inside the ITB foot.

**Absolute calibration: ECE cutoff**

Core TS diagnostic on C-Mod is absolutely calibrated using TIX as a standard. Combustion inferential calibration with TIX has the biggest systematic uncertainty of the measurement error. C-Mod TS diagnostic is calibrated using a far infrared source (Laserlab). C-Mod ECE diagnostic is calibrated using a far infrared source (Laserlab). Calibration function for each SFD is the best function of the residual error. C-Mod ECE diagnostic is calibrated using a far infrared source (Laserlab). Calibration function for each SFD is the best function of the residual error. C-Mod ECE diagnostic is calibrated using a far infrared source (Laserlab). Calibration function for each SFD is the best function of the residual error. C-Mod ECE diagnostic is calibrated using a far infrared source (Laserlab). Calibration function for each SFD is the best function of the residual error. C-Mod ECE diagnostic is calibrated using a far infrared source (Laserlab). Calibration function for each SFD is the best function of the residual error. C-Mod ECE diagnostic is calibrated using a far infrared source (Laserlab). Calibration function for each SFD is the best function of the residual error.

Condition for wave propagation (resonant harmonic X modes):

\[ n_{res} = 2 \times k_{p} \times n_{e} = \left( \frac{\omega_{ce}}{k_{p}} \right)^{2} \]

or

\[ \Omega_{ce} = \frac{\omega_{ce}}{k_{p}} \]

where

* \( n_{res} \) - resonant frequency
* \( \Omega_{ce} \) - reduced cutoff frequency

After second plasma stream with clean ECE cutoffs for each TIX, we can determine absolute calibration coefficients with TIX or far infrared source function for each SFD.

**Comparison with VB-diagnose**

TS density and ECE density profiles

**Evolution of ITB**

ITB formation and evolution is closely seen from TS density profiles and density peaking factor derived from filtered profiles.

**Conclusions**

- New core TS diagnostic on C-Mod measures profiles of electron temperature and density with 3% accuracy.
- Method of absolute calibration using ECE cutoff critical density is implemented.
- There is a good agreement between TS results and LIMPE measurements from other diagnostics: ECE, VB, TIX.
- TS density profiles show peaking during ITB phase and are used in analysis of ITB formation and evolution.
- The density profile has a double-bump structure and edge transition, which gives the position, height, and width of internal transport barrier.
- TS density measured allows us to derive time dependent Zr profiles, which is used in transport analysis.