

Preliminary Comparison of High Electron Temperature Measurements by TS and ECE on EAST under EC and LHW Heating

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Accurate measurement of high electron temperature is of great importance for the study of high-performance plasmas on EAST and for future fusion devices. Thomson scattering (TS) and electron cyclotron emission (ECE) are two of the most widely used diagnostics for electron temperature measurement. Discrepancies between TS and ECE in the high-temperature regime have been reported and investigated on devices such as JET and Alcator C-Mod, which has made this issue an important topic in international cross-diagnostic studies and a sustained concern within the International Tokamak Physics Activity (ITPA).

In this work, a preliminary comparison of high electron temperature measurements by TS and ECE on EAST has been carried out using an updated statistical procedure. The data processing method was developed with reference to a recently proposed standardized approach for cross-diagnostic and cross-machine analysis, while also taking into account the practical characteristics of the TS and ECE systems on EAST. Compared with our previous analysis, the present method provides a more consistent and persuasive statistical basis for evaluating the difference between the two diagnostics.

The present study focuses on plasmas under combined electron cyclotron heating (EC) and lower hybrid wave heating (LHW). After spatial matching between TS and ECE measurement locations, statistics were performed over multiple matched points using a joint averaged temperature parameter. Preliminary results show that ECE is generally higher than TS when the electron temperature is below about 6 keV, while TS tends to become higher than ECE when the electron temperature is above about 6 keV.

These observations indicate that the relationship between TS and ECE on EAST changes with temperature under strong electron-heating conditions. This work provides an updated basis for further studies on diagnostic consistency, cross-validation, and the reliability of high-temperature electron temperature measurements on EAST.

References

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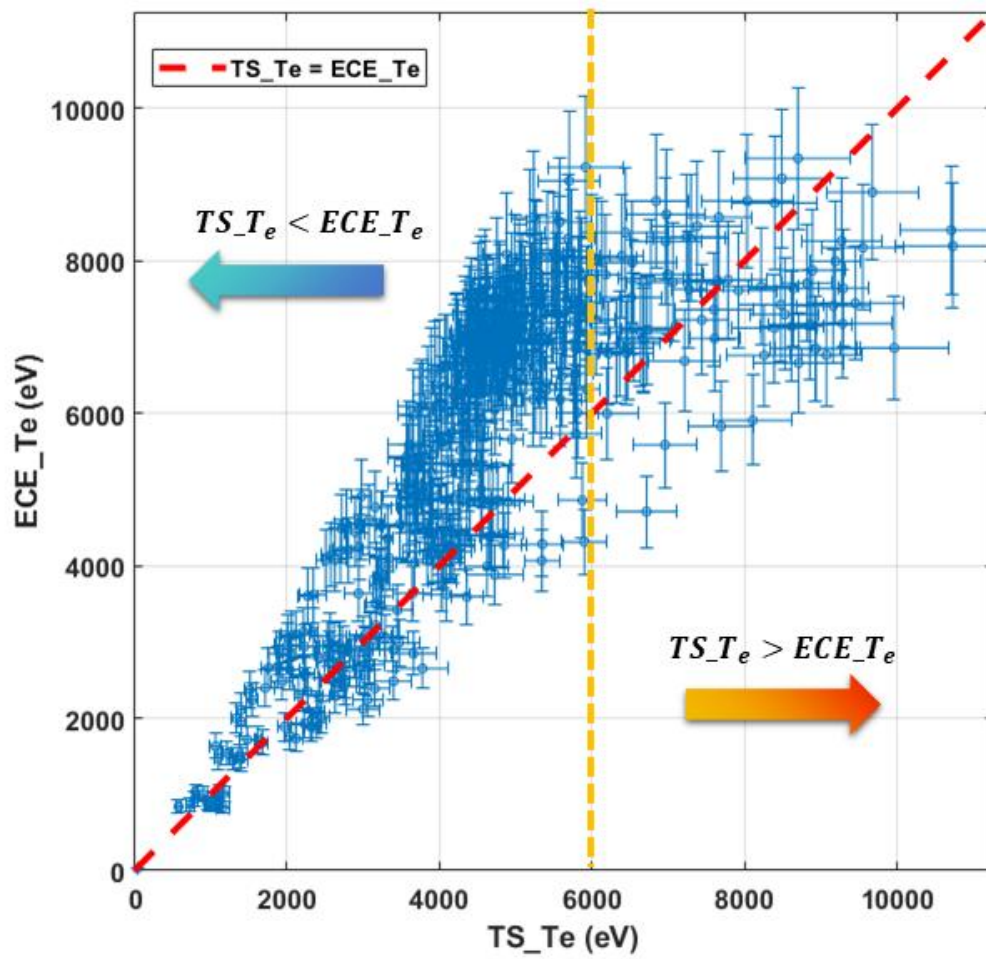


Figure1. Scatter plot of spatially matched TS and ECE electron temperature measurements on EAST under EC and LHW heating.