Comparison of heat flux measurements by IR thermography and probes in the Alcator C-Mod divertor

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1. Abstract

Using molybdenum calorimeters, direct measurements of heat flux are performed through various plasma conditions. Measurements are made through Ohmic and EDA regimes, and compared to measured values from calorimeters, Langmuir Probes, and IR camera. Energy balance calculations are performed to support such a possibility at this time.

2. Experimental

- Comparing IR and calorimetric inferred energy deposition profiles
- Comparing IR and Langmuir probe results for EDA regime
- Made redundant measurements allow an assessment of uncertainty in the energy balance calculations

3. Analysis

Sheath heat flux transmission coefficient

$$\frac{2.5 \times 10^{-6} \left(1 - 0.2 \left( T_e + 7000 \right) \left( 1 - \frac{T_e}{50000} \right) \right)}{2.5 \times 10^{-6} \left(1 - 0.2 \left( T_e + 7000 \right) \left( 1 - \frac{T_e}{50000} \right) \right)}$$

Secondary electron emission effects can not account for the discrepancy; this effect has the wrong dependence on $T_e$.

4. Results

Calorimeters and IR images agree better than 20%

- IR camera data shows a close match of about 15% of the peak heat flux extending the measurement into the SOL.
- Comparison of the IR-inferred heat flux profiles with LPs (assuming $T_e = 7.2 \, eV$) extends the ability to be re.

5. Conclusions

- A reproducible sheath heat flux profile through a variety of plasma conditions.
- $T_e$ is inversely correlated to measured values from calorimeters.
- Primary calorimeter assembly

Poster available at: mit.edu/brunner/www/