VISIBLE CONTINUUM MEASUREMENTS ON THE
ALCATOR C TOKAMAK: CHANGES IN PARTICLE TRANSPORT
DURING PELLET FUELLED DISCHARGES

Mark Edward Foord

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ABSTRACT

A spatially resolving visible light detector system is used to measure
continuum radiation near 5360Å on the Alcator C Tokamak. For the typically
hot ($T_e \gg 50$ eV) plasmas studied, the continuum emission is found to be
dominated by bremsstrahlung radiation near this wavelength region. Accurate
determinations of $Z_{\text{eff}}$ are obtained from continuum measurements using inde-
pendently determined temperature and density measurements. For discharges
with line-average electron densities $\bar{n}_e > 2 \times 10^{14}$ cm$^{-3}$, the weighted line-average
$Z_{\text{eff}} \approx 1.2$, and $Z_{\text{eff}}(r)$ is found to have a relatively flat profile shape, inconsis-
tent with neoclassical predictions. Small changes in the continuum brightness
($\Delta B/B \approx 0.5\%$) due to sawteeth are detected and found to be consistent with
a simple sawtooth model.

Density profiles during high density, clean ($\bar{Z}_{\text{eff}} \approx 1.2$), pellet fueled dis-
charges, are also determined and are used to study the changes in particle trans-
port after injection. For discharges with sufficiently large pellet density increases
($\Delta \bar{n}_e/\bar{n}_e \geq .7 .9$), density profiles are found to become more peaked following
the injection. In these cases, the profiles are found to remain peaked for the
remainder of the discharge, or until a ‘giant’ sawtooth or minor disruption abruptly
returns the profiles to a flatter pre-pellet condition. Both the threshold for the
particle transport changes and the effect of giant sawteeth are found to be well
correlated with changes in trace impurity transport.

Analysis of density profiles after pellet injection yields information about the
radial diffusion and convection velocity of the plasma particles. The peakedness
in the density profiles, observed after pellet injection, is attributable mostly to
increases in inward convection. It is concluded that neoclassical fluxes are too
small to account for these changes. Predictions from collisionless $\eta$, transport
theory are found to be qualitatively consistent with the observed changes in the
convection velocity.

Thesis Supervisor:

Dr. Earl Marmar, Principal Research Scientist, Plasma Fusion Center.

M.I.T

Thesis Reader:

Ian Hutchinson, Professor of Nuclear Engineer, M.I.T