THE ROLE OF RADIATION ON THE POWER
BALANCE OF THE
ALCATOR C TOKAMAK

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ABSTRACT

The radiation from the Alcator C tokamak plasma was measured with a
16 element, collimated, bolometer array and a single element bolometer
flush with the vacuum chamber wall. In the low density regime, \( n_e < 2 \times 10^{14} \text{ cm}^{-3} \), and with molybdenum limiters, radiation dominated the
power balance, accounting for more than half the ohmic input, and
occasionally collapsing the temperature profile into a hollow shape. The
source of the radiation was molybdenum line emission.

At high densities, central emission became negligible, (i.e. less
than 10\% of the central ohmic input). However, an enhanced emission
region developed on the upper inside edge of the plasma. This region,
called a marfe, radiated strongly at wavelengths corresponding to low
temperature processes, such as H\_a and Carbon III emission. The total
power lost was comparable to the rest of the plasma.

A Langmuir probe revealed that the temperature was low and the
density was high in the marfe, compared to other edge regions. The power
conducted to the limiter in the marfe region was roughly a factor of 2
higher than the power conducted to the limiter outside the marfe. Other
Langmuir probes spaced around the torus showed a depletion of density
simultaneously with the increase in density seen at the marfe. Particles
appeared to be transported along field lines.

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