carbon-to-oxygen density ratio, the metallic impurity densities, Z_{eff}, and $n_e(0)$. The results given in Table II were calculated using the carbon-to-oxygen density ratio from the HI-like ions. The carbon and oxygen concentrations obtained by modelling the line brightnesses directly were lower than these values by a factor of approximately 2.5 and were clearly inconsistent with the measured Z_{eff}. Table II shows that carbon was the major contributor to Z_{eff} in this discharge, and that, as a result of dilution of the working gas by impurities, the deuteron concentration was 72%. Because the contribution of carbon to the total Z_{eff} was greater than or equal to that of oxygen in the discharges considered here, the deduced oxygen densities were more sensitive than the carbon densities to uncertainties in the carbon-to-oxygen density ratio. Since this ratio was not measured to better than a factor of two, the absolute oxygen densities were uncertain by approximately this amount in many cases.

The central radiated power density and the total power radiated by carbon and oxygen obtained from MIST modelling are given in Table II. The total radiated power measured by spectroscopy was 640 kW, in excellent agreement with the bolometer measurement of 705 kW. Spectroscopic and bolometric radiated power profiles are compared in Fig. 5. The spectroscopic profile includes contributions from carbon, oxygen, nickel, and chromium. Agreement is quite good. The radiated power profile was hollow, as expected when carbon and oxygen are the major impurities. It is interesting to note that the central radiated power density was primarily due to carbon and oxygen radiation; low-Z impurity densities were sufficiently higher than those of metallic impurities that bremsstrahlung from electron collisions with low-Z impurities dominated line emission from metallic impurities in the plasma core. (By comparison, bremmstrahlung emitted by electron-deuteron collisions yielded 1.1 mW/cm^3 radiated power on axis.)

IV. Impurity Behavior in Neutral-Beam-Heated and Ohmic Discharges

1. Time Evolution During a Neutral-Beam-Heated Discharge

This section examines the time evolution of Z_{eff}, impurity densities, and radiative losses during a beam-heated discharge. Figure 6 shows the time evolution of $\bar{n}_e$ during a discharge with 5.6 MW beam power, I_p = 2.2 MA, and B_T