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SPECTROSCOPY OF AXIOTHETAIC PLASMA BUNCHES
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INTRODUCTION
The importance of an angular deviation of the light ray through an inhomogeneous plasma has been assessed in the field of interferometry for quite a long time. The schlieren technique is based on measurements of the deviation of the light ray in the presence of refractive index gradients. However, the induced effect was usually neglected in spectroscopic considerations.

The aim of this paper is to draw attention to the possible errors of systematic error in spectroscopic measurements due to the refraction of radiation in an optically thin, circularly symmetric plasma source.

NUMERICAL PROCEDURE
The angular deviation of a ray in an inhomogeneous medium can be estimated from the radius of the curvature R of the deflected path given by

$$\frac{1}{R} = \frac{1}{R_0} + \frac{\Delta n}{n}$$

where $\mu$ is the local phase refractive index, and n is the local unit vector perpendicular to the ray. Since this work deals with axial investigations of plasma only, deflections of the ray for a cylindrical geometry are considered. For this two-dimensional model of refractive index with the plasma axis and assumed parallel to the incident ray, it is possible, in this case, to obtain the differential equation of the ray trajectory through plasma from eq. 1

$$\frac{dx}{dy} = \frac{\mu - 1}{\mu R_0}$$

and the radius of curvature

$$R = \frac{\mu R_0}{x_0}$$

where $\mu_0$ is the refractive index at the point of incidence of the ray, on the other hand the radial distribution of the plasma refractive index can be represented approximately by the following relationship

$$\mu = \mu_0 + \frac{\Delta n}{n_0}$$

where $\mu_0$ is the refractive index at the plasma axis and $\Delta n$ and $n_0$ are constants. Since it is not possible to solve eq. 2 analytically, it is necessary to employ an approximate method in order to obtain the ray trajectory. Therefore, the ray path is determined from the equation of the corresponding curvature circle at the initial point of the trajectory. The next point on the trajectory is computed from the equation and the whole procedure is repeated for the other points. This can be easily understood from the following equations and the notation given in Fig. 1. The coordinates of some point on the trajectory are

$$\begin{align*}
x &= x_0 + \Delta x + (1 + \frac{\Delta x}{R_0}) \sqrt{\frac{\Delta x}{R_0}} \\
y &= y_0 + \Delta y + \frac{1}{2} \left(1 - \frac{\Delta y}{R_0}ight) \left(1 + \frac{\Delta y}{R_0} \right)
\end{align*}$$

where $\Delta x$ is the step length.

From the eqs. 2, 4 and 6 it is possible to obtain the point on the ray path with an accuracy determined by the magnitude of the step length $\Delta x$.

RESULTS
The light distribution in refractive index is estimated from

$$\mu = 1 + \frac{\Delta n}{n_0}$$

where $\mu_0$ is the refractive index at the plasma axis and $\Delta n$ is the increment of electron density. The electron density of the plasma is determined by integration of the measured values of optical density. The contribution of each ion species to the light distribution of $\mu_0$ at the contribution of each ion species has been calculated.

Further calculations of the behavior of the radial light intensity distribution of the light intensity distribution of a radially inhomogeneous plasma are obtained using the present technique. Numerical variation of the refractive index at a wavelength of 4000 A and 6500 A were evaluated using the temperature profile of plasma by K. V. M. L. R. B. and the composition of plasma at atmospheric pressure. From the radial distribution of refractive index, the ray trajectory is obtained. The plasma light intensity distribution is obtained using the numerical technique.