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A spatio-kinematic study of the planetary nebula NGC 246 in the [OIII] 5007 Å line

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1. Introduction

NGC 246 (PK 118 –74.1) is a high excitation Planetary Nebula with a detached binary nucleus and is morphologically peculiar in having many filamentary structures, clumps and a sharp rim towards the west side of the nebula (Acker et al., 1992). The sharp rim probably is the result of its interaction with the interstellar medium (Borkowski et al., 1990). We report here new [OIII] 5007 Å line observations made with an aim to look for possible kinematic signatures of such an interaction.

2. Observations and results

New [OIII] 5007 Å line observations were made using the PRL Imaging Fabry-Perot Spectrometer (IFPS) (Seema et al., 1992) at the f/13 cassegrain focus of the 1.2m telescope, Mt.Abu. The IFPS uses an Imaging Photon Counting Detector. A Fabry-Perot etalon having a finesse of 25 and a free-spectral range of 3 Å was used to obtain two interferograms on the nebula. An image quality interference filter of FWHM 15 Å was used to isolate the 5007 Å line. The overall spatial resolution varied from 4" × 12" near the centre to about 4" × 28" at the higher order fringes in the peripheral zones. The FWHM of the instrumental function was 7 km/s while centroiding (for radial velocity) was possible to an accuracy of ≤ 2 km/s depending upon the S/N ratio. The two interferograms were taken with cumulative integration times of 60 mts and 90 mts. The analysis was done after subtracting the averaged dark frames taken before and after the object frames. In order to improve the S/N ratio, the fringe was integrated over radial sector of 15° or 20°. This restricted the overall spatial resolution to 4" × 12" near the centre and 4" × 28" at the peripheral zones. A total of 37 line profiles were obtained from the two interferograms covering the entire nebula. A number of these profiles show clear splitting while at some places the profiles are broad or asymmetric. A multigaussian fitting package was used to obtain line positions, width and amplitudes. A maximum expansion velocity of 37 km/s was obtained at the centre of the nebula. The expansion velocity showed a sharp decreasing trend as one approaches the distinct rim on the western edge of the nebula. The expansion velocity at other places, though decreasing, showed a gradual change. We believe that our results indicate, for the first time, a slow-down of the nebular expansion due

to the interaction of the interstellar medium. Further quantitative interpretation and modelling are in progress.

References

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