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A CIRCUMNUCLEAR STAR FORMATION RING IN THE BL LAC OBJECT PKS 2005−489

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We present a FORS1 (VLT) spectroscopic study of the stellar population content in PKS 2005−489, one of the nearest BL Lac objects, with a redshift of 0.071 (Falomo et al 1987). Low dispersion long slit spectroscopy, covering the interval between 484 nm and 720 nm, was obtained with a total integration time of 2400 seconds. The data reduction was done in the common manner using IRAF tasks for long slit spectra.

The high S/N of the spectra allows us to investigate in detail the spatial distribution of the emission from the galaxy. In Figure 1 we present the spatial distribution of Hα and [N II]λ6583 emission lines, taken along the slit. In the central region (3 arcsec) the spatial profile of the continuum and line emission follows that of the PSF, indicating that the central unresolved source is dominant. Outside this region the profile in the emission lines deviates significantly from that of the PSF. The shape of the spatial intensity distribution suggests the presence of an extended emitting ring at about 2 arcsec from the nucleus. In addition, the spatially resolved spectrum shows a progressive displacement of the central wavelength of the Hα line emission, going from one side to the other along the slit. This clearly indicates a rotational component of the ring.

The nature of the emission is analyzed by means of the [O III]λ5007/Hβ and [N II]λ6583/Hα emission line ratios. The values of the nuclear region are of an AGN nature, while the off-nuclear values are typical of H II galaxies. This strongly supports the presence of a star formation circumnuclear region. Using the calibration reported by Panuzzo et al. (2003) we have obtained a SFR(Hα) = 0.15 $M_{\odot}$/yr.

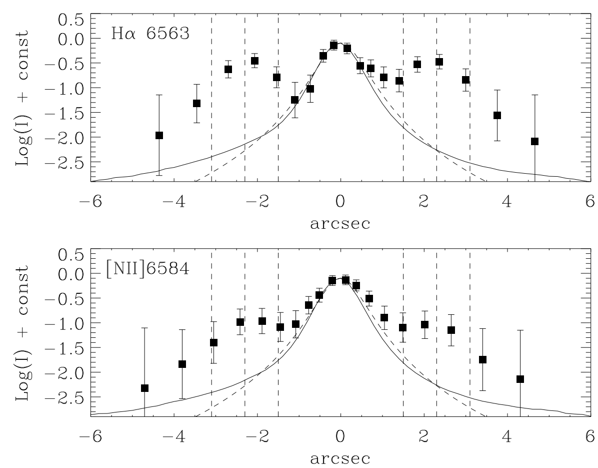

Fig. 1. Line continuum and Hα and [N II]λ6583 emission profiles extracted along the slit. The solid line is the pseudo-continuum flux under the emission line. The dashed line is the profile of a star, representing the PSF of the observations.

Observations with 8-meter class telescopes allow us to discover that the QSO shining in PKS 2005−489 is accompanied by star formation in a circumnuclear ring; unveiling, for the first time, a possible rejuvenation episode in an elliptical galaxy, where part of the gas content is being accreted onto the central super massive black hole.

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