

## Multiple Collimated Outflows in the Planetary Nebula IC 4593?

**Romano L.M. Corradi, Martin Guerrero, Arturo Manchado and Antonio Mampaso**

IAC, La Laguna, Tenerife, Spain

Superb-seeing ( $0''.40$  FWHM) narrowband images and high resolution ( $R=60000$ ) spectra of the asymmetrical planetary nebula IC 4593 have been used in order to study its detailed morphology and kinematics.

The nebula is found to consist of a bright rim of  $2''.5$  diameter surrounded by a highly structured shell of decreasing brightness. Besides the previously known pair of symmetrical ansae, in this region a complex system of low-ionization knots are also revealed. The knots, which morphologically resemble outward-facing bow-shocks, are located at different position angles and distances from the centre, present very low radial velocities, extended tails pointing toward the central star, as well as enigmatic extensions in the outer regions of the nebula. The possibility that the observed features are multiple collimated outflows propagating from the central star throughout the nebula along very different directions is discussed.

The outer asymmetrical shell, whose formation was previously interpreted as due to interaction with the interstellar medium of the material ejected from a fast moving progenitor, is found to be surrounded by a faint, extended, asymmetrical and fragmented halo.