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UNCOVERING THE INTEGRAL SPECTRAL CHARACTERISTICS OF THE PLANETARY NEBULA IC4642

Abstract

Abstract This study aims to conduct a comprehensive spectral analysis of the Galactic planetary nebula (PN) IC4642 using the Integral Field Unit (IFU) Spectroscopy Observation technique. The main objectives of the work involve investigating the physical conditions, chemical abundances, excitation mechanisms, and structures at different scales within IC4642. Additionally, the study aims to gain insights into the characteristics of the central star responsible for the formation of this nebular structure. IFU spectroscopy provides spectra that cover a significant portion of the celestial object, potentially capturing the entire object within the visible spectral region if its angular diameter is smaller than the spectrograph's field of view. By analyzing the obtained spectrum, we expect to acquire the data necessary for determining the abundance of chemical elements in the nebula and establishing physical parameters such as ionic temperature and gas shell density. The spectrum will also assist in creating maps of different ionization regions within the nebula, interpreting its internal composition, and measuring its expansion and radial velocities. This work takes a unique and comprehensive approach to studying IC4642, offering the potential for new discoveries and valuable insights. By integrating IFU spectroscopy with advanced theoretical frameworks, this study will contribute significantly to our understanding of planetary nebulae in general, as well as their significance in the broader context of stellar and galactic evolution. This research aligns closely with Saudi Vision 2030 and the research focus of the Saudi Space Agency (SSA) in several significant ways: (1) Space Science Focus where the research focus of the Saudi Space Agency naturally includes astronomy and space science; (2) This work contributes to the Saudi Vision 2030 by advancing scientific knowledge, promoting innovation and fostering scientific excellence in the field of space science and astrophysics.