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A quasi-periodicity in the optical polarization of the blazar PKS 2155-304?

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Abstract content
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We report the possible detection of a quasi-periodic oscillation (QPO) in the polarized flux of the gamma-ray emitting blazar PKS 2155-304. The source was recorded with the HIgh-Speed Photo-POlarimeter (HIPPO), which was mounted on the 1.9 m Radcliffe telescope, operated by the South African Astronomical Observatory (SAAO). The microvariability of the polarization was observed from 25 to 27 July 2009 using a temporal resolution of 5 minutes. During this time, the mean daily polarization degree increased from roughly 3% to 10%. Simultaneous very high-energy (VHE, photons exceeding GeV energies) gamma-ray measurements with the High Energy Stereoscopic System (H.E.S.S.) showed that this increase in the polarization degree coincided with an increase in the gamma-ray flux of the source. Inspection of the intranight variability of the polarization showed that, on 24 July 2009, the polarized flux appeared to be modulated by a periodic component. This polarized QPO occurred at the onset of the increase in gamma-ray activity in PKS 2155-304, which was itself preceded by a gamma-ray flare that reached its peak flux on 23 July 2009, one day before the QPO developed. A periodogram of the polarized flux revealed the presence of a significant peak at a frequency corresponding to period of ˜30 minutes. PKS 2155-304 is one of a small number of active galactic nuclei (AGN) for which convincing evidence of QPOs have been found. The most recent claim is a ˜4.6 hour periodicity that was detected on 1 May 2006 with the XMM-Newton telescope at X-ray energies (0.3-10 keV). This is the first detection of QPO activity from blazars in the optical and polarized light, opening up a new method of studying the AGN phenomenon.

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PhD

Main supervisor (name and email)
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