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Modelling the Spectral Energy Distributions and Multi-Wavelength Polarisation of Blazars

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The radio through optical/UV/X-ray emission from blazars is dominated by highly polarised synchrotron emission from relativistic electrons in their jets. The total degree of polarisation is a composition of the polarised non-thermal synchrotron emission and thermal unpolarised emission components from the dusty torus, host galaxy, emission lines from the broad line region (BLR) and accretion disk. For some blazars the accretion disk is not directly observed as it is outshone by synchrotron emission. However, it reveals its presence through a decrease of the optical polarisation degree towards higher frequencies in spectropolarimetry observations, where the disk is diluting the synchrotron polarisation. Considering a leptonic model, the high-energy X-ray and gamma-ray emission can be modelled as polarised synchrotron self-Compton radiation which is diluted by Compton up-scattering of unpolarised external radiation fields of the BLR and accretion disk. A model is constructed that simultaneously fits spectral energy distributions and multi-wavelength polarisation of blazars. A target-of-opportunity, Large Science program “Observing the Transient Universe” from the *Southern African Large Telescope*, provides spectropolarimetry data for flaring blazars in the optical-UV regime. This program includes co-ordinated multi-wavelength observations from the *Las Cumbres Observatory*, the *Swift*-XRT and the *Fermi*-LAT. We present results for the flat spectrum radio quasar 4C+01.02 ($z = 2.1$), for which we constrained its black hole mass as $4 \times 10^8 M_{\odot}$ and obtained a scaling factor that is indicative of the degree of order of the magnetic field (and dependent on line-of-sight) in the emission region.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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