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Multi-wavelength polarization signatures of jets

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The underlying particle acceleration mechanism in blazars and the radiation mechanism of the blazar high-energy spectral component are still not well understood. Multi-wavelength polarization signatures can provide unique constraints on the blazar radiation and plasma physics. This talk aims to emphasize the need of the multi-zone picture for the blazar leptonic and hadronic models. Under such a scenario, the polarization degree of the blazar high-energy spectral component from leptonic and hadronic models can be drastically different from the one-zone picture. Specifically, the leptonic polarization is mostly undetectable by IXPE and future X-ray and gamma-ray polarimeters such as COSI. Thus any detection of polarization in the high-energy spectral component is strong evidence for hadronic models. Non-detection, however, cannot rule out hadronic models. In addition, we perform integrated particle-in-cell and polarized radiation transfer simulations to characterize multi-wavelength radiation and polarization signatures from magnetic reconnection and turbulence scenarios. Our results suggest that reconnection in a partially turbulent blazar jet can best explain the multi-wavelength polarization signatures in high-synchrotron-peaked blazars reported by IXPE.

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