Long-term Study of Synchrotron Polarization Emission from a Sample of Flat Spectrum Radio Quasars

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Flat Spectrum Radio Quasars (FSRQs) are a subclass of blazars that exhibit prominent broad emission lines with an equivalent width > 5 Å. Their typical observational properties encompass rapid flux variation throughout the entire electromagnetic spectrum, intense luminosity, and strong polarization. The significant variability observed in the degree of polarization can be utilized to probe the physics of the emission process and nature of the magnetic field including the particle acceleration in the source. In this contribution, we present the results from a long-term study of optical polarization, measured in the wavelength range of 500 nm to 700 nm, from a sample of five well-known FSRQs (3C 273, PKS 1222+216, 3C 279, 3C 454.3, and B2 1633+382). We use the publicly available data on the degree of linear polarization and angle of polarization from the Spectropolarimeter (SPOL) at the Steward Observatory of the University of Arizona for the period 2008-2018. The polarization degree is observed to be highly variable, with fractional variability amplitudes ranging between 54% and 85%. Modelling of long-term degree of polarization using synchrotron radiation of relativistic electrons suggests that the emission region is filled with a magnetic field having two components: chaotic and ordered. The maximum degree of polarization can be attributed to the dominant ordering of the magnetic field in the emission region due to the turbulent moving shock.