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MULTIFREQUENCY PHOTO-POLARIMETRIC WEBT OBSERVATION CAMPAIGN on the BLAZAR S5 0716+714: SOURCE MICROVARIABILITY and SEARCH for CHARACTERISTIC TIMESCALES

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Abstract

© 2016. The American Astronomical Society. All rights reserved..Here we report on the results of the Whole Earth Blazar Telescope photo-polarimetric campaign targeting the blazar S5 0716+71, organized in 2014 March to monitor the source simultaneously in BVRI and near-IR filters. The campaign resulted in an unprecedented data set spanning ~110 hr of nearly continuous, multiband observations, including two sets of densely sampled polarimetric data mainly in the R filter. During the campaign, the source displayed pronounced variability with peak-to-peak variations of about 30% and "bluer-when-brighter" spectral evolution, consisting of a day-timescale modulation with superimposed hour-long microflares characterized by ~0.1 mag flux changes. We performed an in-depth search for quasi-periodicities in the source light curve; hints for the presence of oscillations on timescales of ~3 and ~5 hr do not represent highly significant departures from a pure red-noise power spectrum. We observed that, at a certain configuration of the optical polarization angle (PA) relative to the PA of the innermost radio jet in the source, changes in the polarization degree (PD) led the total flux variability by about 2 hr; meanwhile, when the relative configuration of the polarization and jet angles altered, no such lag could be noted. The microflaring events, when analyzed as separate pulse emission components, were found to be characterized by a very high PD (>30%) and PAs that differed substantially from the PA of the underlying background component, or from the radio jet positional angle. We discuss the results in the general context of blazar emission and energy dissipation models.

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Keywords

acceleration of particles, BL Lacertae objects: individual (S5 0716+714), galaxies: active, galaxies: jets, polarization, radiation mechanisms: non-thermal