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On the the time-variable rotation measure in the core region of the TeV blazar Mrk 421

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In this talk we will discuss the time variable rotation measure (RM) observed in the core region of the TeV blazar Markarian 421 (Mrk 421). These results are based on a one-year, multi-frequency (15, 24, and 43 GHz) Very Long Baseline Array monitoring campaign. We explore the possible connection between the RM and the accretion rate and we investigate the Faraday screen properties and its location with respect to the jet emitting region. Among the various scenarios, the jet sheath is the most promising candidate for being the main source of Faraday rotation. We interpret the two RM sign reversals observed during the one-year monitoring within the context of the magnetic tower models. We invoke the presence of two nested helical magnetic fields in the relativistic jet with opposite helicities, whose relative contribution produce the observed RM values. Additional scenarios are considered to explain the observed RM time evolution.

Primary author: Dr LICO, Rocco (Max Planck Institute for Radio Astronomy (MPIfR))

Co-authors: FUENTES, Antonio (IAA-CSIC); Dr GOMEZ, Jose Luis (IAA-CSIC); Dr ASADA, Keiichi (Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan)

Presenter: Dr LICO, Rocco (Max Planck Institute for Radio Astronomy (MPIfR))

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