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Redshift measurement of the BL-Lac gamma-ray blazar PKS 1424+240

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Gamma-ray emission in the range of VHE (TeV) is strongly attenuated by the photon-photon interaction with the extragalactic background light (EBL), the diffuse cosmological radiation field (UV to far-IR) encompassing all radiative energy releases since recombination. As a consequence all discovered VHE sources are relatively close ($z < 0.6$, except perhaps for the recent detection of the blazar S3 0218+357 at $z=0.944$ – ATel \#6349). For HE (GeV) gamma-rays this attenuation is negligible so, modeling the drop from HE to VHE caused by this interaction it is possible to either study the EBL or to have an estimation of the redshift. The majority of the extragalactic VHE gamma-ray sources are BL-Lac blazars. The lack of both emission and absorption lines in BL-Lacs makes the estimation of spectroscopic redshifts very difficult, then the method using gamma-ray observations is applied whenever possible.

Motivated by the evidence that BL-Lacs are typically hosted by elliptical galaxies, which in turn are associated to groups or clusters, we have proposed an alternative method to estimate the redshift of blazars in an indirect way (Muriel et al., A&A 574, 101, 2015), for which spectroscopic observations of the nearby galaxies are necessary.

The BL-Lac blazar PKS 1424+240 was detected at HE by Fermi-LAT and at VHE by H.E.S.S. Estimations for its redshift include three attempts using gamma-ray observations and one obtained by analyzing Ly_β and Ly_γ absorption lines observed in the far-UV spectra (from HST/COS) caused by absorbing gas along the line of sight. They allowed to constrain the redshift range to $0.6 < z < 1.19$, which places PKS 1424+240 in the very interesting condition to be one of the few most distant blazars detected at VHE, with redshift in a range never populated by other VHE source.

We have proposed to perform optical spectroscopic observations of PKS 1424+240 and the visible galaxies within the field at high S/N ratio using Gemini. In this work we present the analysis of those spectra.

Collaboration

– not specified –

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Primary author: Dr ROVERO, Adrian C. (Instituto de Astronomia y Fisica del Espacio (IAFE, CONICET-UBA))

Co-authors: Dr PICHEL, Ana (Instituto de Astronomia y Fisica del Espacio (IAFE, CONICET-UBA)); Dr DONZELLI, Carlos (IATE); Dr MURIEL, Hernan (IATE)

Presenter: Dr ROVERO, Adrian C. (Instituto de Astronomia y Fisica del Espacio (IAFE, CONICET-UBA))

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