

The Blazar Times

A Research Newsletter Dedicated to the BL Lac and Blazar Phenomena

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Journal Abstracts

BL Lac Identification for the Ultraluminous X-ray Source Observed in the Direction of NGC 4698

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We report the identification of the optical and radio counterparts of the ultraluminous X-ray (ULX) source XMMU J124825.9+083020 (NGC4698-ULX1). The optical spectrum taken with the VLT yields a redshift of $z = 0.43$, which implies that the ULX is not associated with the nearby galaxy NGC 4698. The spectral energy distribution calculated from the available data indicates that the source is likely to be a BL Lac object. The possible synchrotron peak at X-ray energies suggests that this source may be a γ -ray emitter.

Accepted by A&A

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For preprints via ftp or WWW: <http://arxiv.org/abs/astro-ph/0209500>

Cross-spectral Analysis of the X-ray Variability of Mrk 421

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Using the cross-spectral method, we confirm the existence of the X-ray hard lags discovered with cross-correlation function technique during a large flare of Mrk 421 observed with *BeppoSAX*. For the 0.1–2 versus 2–10 keV light curves, both methods suggest sub-hour hard lags. In the time domain, the degree of hard lag, i.e., the amplitude of the 3.2–10 keV photons lagging the lower energy ones, tends to increase with the decreasing energy. In the Fourier frequency domain, by investigating the cross-spectra of the 0.1–2/2–10 keV and the 2–3.2/3.2–10 keV pairs of light curves, the flare also shows hard lags at the lowest frequencies. However, with the present data, it is impossible to constrain the dependence of the lags on frequencies even though the detailed simulations demonstrate that the

hard lags at the lowest frequencies probed by the flare are not an artifact of sparse sampling, Poisson and red noise. As a possible interpretation, the implication of the hard lags is discussed in the context of the interplay between the (diffusive) acceleration and synchrotron cooling of relativistic electrons responsible for the observed X-ray emission. The energy-dependent hard lags are in agreement with the expectation of an energy-dependent acceleration timescale. The inferred magnetic field ($B \sim 0.11$ Gauss) is consistent with the value inferred from the Spectral Energy Distributions of the source. Future investigations with higher quality data that whether or not the time lags are energy-/frequency-dependent will provide a new constraint on the current models of the TeV blazars.

Accepted by MNRAS

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For preprints via ftp or WWW: <http://arXiv.org/abs/astro-ph/0209063>

Unifying B2 radio galaxies with BL Lac objects

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In an earlier paper we presented nuclear X-ray flux densities, measured with *ROSAT*, for the B2 bright sample of nearby low-luminosity radio galaxies. In this paper we construct a nuclear X-ray luminosity function for the B2 radio galaxies, and discuss the consequences of our results for models in which such radio galaxies are the parent population of BL Lac objects. Based on our observations of the B2 sample, we use Monte Carlo techniques to simulate samples of beamed radio galaxies, and use the selection criteria of existing samples of BL Lac objects to compare our simulated results to what is observed. We find that previous analytical results are not applicable since the BL Lac samples are selected on beamed flux density. A simple model in which BL Lacs are the moderately beamed ($\gamma \sim 3$) counterparts of radio galaxies, with some random dispersion (~ 0.4 decades) in the intrinsic radio-X-ray relationship, can reproduce many of the features of the radio-selected and X-ray-selected BL Lac samples, including their radio and X-ray luminosity functions and the distributions of their radio-to-X-ray spectral indices. In contrast, models in which the X-ray and radio emission have systematically different beaming parameters cannot reproduce important features of the radio-galaxy and BL Lac populations, and recently proposed models in which the radio-to-X-ray spectral index is a function of source luminosity cannot in themselves account for the differences in the slopes of the radio and X-ray-selected BL Lac luminosity functions. The redshift distribution and number counts of the X-ray-selected EMSS sample are well reproduced by our best models, supporting a picture in which these objects are beamed FRI radio galaxies with intrinsic luminosities similar to those of the B2 sample. However, we cannot match the redshift distribution of the radio-selected 1-Jy sample, and it is likely that a population of FR II radio galaxies is responsible for the high-redshift objects in this sample, in agreement with previously reported results on the sample's radio and optical-emission-line properties.

Accepted by MNRAS

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For preprints via ftp or WWW: <http://arXiv.org/abs/astro-ph/0209099/>

The Black Hole Masses and Host Galaxies of BL Lac Objects

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We have measured the central stellar velocity dispersion in the host galaxies of 11 BL Lac objects with redshifts $z \leq 0.125$. The range of velocity dispersions, $\sim 170 - 370$ km/s, is similar to that of nearby radio galaxies. Using the correlation between stellar velocity dispersion and black hole mass defined for nearby galaxies, we derive estimates of the black hole masses in the range $10^{7.9} - 10^{9.2} M_{\odot}$. We do not find any significant difference between the black hole masses in high-frequency-peaked and low-frequency-peaked BL Lac objects. Combining the velocity dispersions with

previously measured host galaxy structural parameters, we find that the host galaxies lie on the fundamental plane of elliptical galaxies. This supports the conclusions of imaging studies that the majority of BL Lac hosts are normal giant ellipticals.

Accepted by ApJ.

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For preprints via ftp or WWW: <http://xxx.lanl.gov/abs/astro-ph/0209562>

Abstract Guidelines

Abstracts for “The Blazar Times” are solicited for papers that have been recently accepted for publication by a refereed journal, and for recent Ph.D. theses. Please do not submit an abstract before it has been accepted, nor after it is published. Abstracts from papers which are not refereed (e.g., conference proceedings) are not accepted.

The subject matter should pertain directly to the BL Lac and/or blazar phenomenon in general. Both observational and theoretical abstracts are appropriate. Abstracts from papers dealing with other classes of AGN will generally not be included unless they explicitly discuss their relevance to the blazar phenomenon; however exceptions to this rule will be considered.

A monthly call for abstracts will be issued and abstracts received by the last day of the month will usually appear in the following month’s newsletter. Announcements of general interest to the BL Lac and blazar communities may also be submitted for posting in the newsletter. These might include (but are not restricted to) the following: (i) *Job Openings* directed toward blazar researchers, (ii) announcements of *Upcoming Meetings*, (iii) announcements of *Upcoming Observing Campaigns* for which participation is solicited from the community at large, (iv) reviews of *New Books*, and (v) *General Announcements* that provide or request research-related information.

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