Mem. S.A.It. Vol. 80, 229

Memorie della

New ESO Very Large Telescope spectroscopy of BL Lacertae objects

S. Ciprini[1,2,3], B. Sbarufatti[4], J. Kotilainen[3], R. Decarli[5], A. Treves[5], A. Veronesi[5], and R. Falomo[6]

[1] Physics Department University of Perugia, Via A. Pascoli, 06123 Perugia, Italy
e-mail: stefano.ciprini@pg.infn.it
[2] I.N.F.N. Perugia Section, Via A. Pascoli, 06123 Perugia, Italy
[3] Tuorla Observatory, University of Turku, Väisäläntie 20, 21500 Piikkiö, Finland
[4] INAF, Istituto di Astrofisica Spaziale e Fisica Cosmica di Palermo, Via Ugo La Malfa 153, 90146 Palermo, Italy
[5] Università dell'Insubria Via Valleggio 11, 22100 Como, Italy
[6] INAF, Osservatorio Astronomico di Padova, Vicolo dell'Osservatorio 5, 35122 Padova, Italy

Abstract. The quasi-featureless spectra of BL Lac objects hinder the determination of their redshifts. Nevertheless the knowledge of this parameter is crucial to understand their physics. An ongoing program at the ESO VLT for high S/N optical spectroscopy of BL Lac objects lacking a firm redshift estimate is briefly introduced.

Key words. BL Lacertae objects: general – Techniques: spectroscopic – Galaxies: distances and redshifts

1. Introduction

The featureless spectra of BL Lacertae objects (BL Lacs) hinder the determination of their redshifts. Nevertheless the knowledge of blazars distance is important to constraint their physics and the bolometric emission power, to select the best gamma-ray blazar-probes for the study of the cosmic extragalactic background light (EBL), to allow a rather sure "blazar" classification of newly discovered high-energy sources, and sometimes to have the right blazar-identification between close optical pair/multiples sources.

In this view a new program at the ESO 8m VLT for high S/N optical spectroscopy of BL Lac objects lacking a firm redshift estimate is ongoing through 3 VLT runs accepted from 2006 (ESO P77, P81, P82). This recent program, tailored for the new γ-ray era of AGILE, GLAST and the current Cherenkov telescopes (like MAGIC, HESS and VERITAS), follows in the footsteps of the successful ESO VLT program performed in 2003-2004 (3 runs ESO P71, P72, P73, Sbarufatti et al. 2005, 2006).

2. Observations and results

Observations for our ESO P81 run are still ongoing in the current semester, while the ESO

Send offprint requests to: S. Ciprini

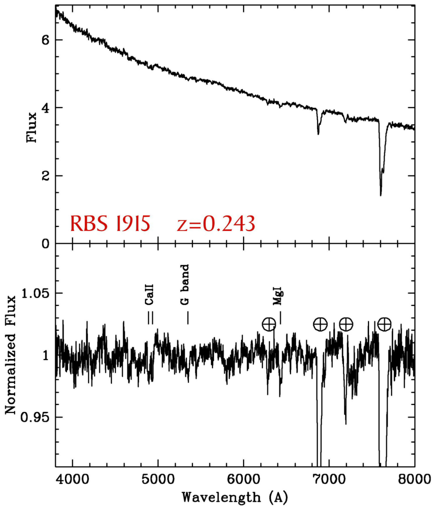

Fig. 1. ESO VLT optical spectrum of RBS 1915, a X-ray selected BL Lac object. The spectrum reported by Chavushyan et al. (2000) was featureless. Our VLT spectrum, obtained with high S/N (160) and spectral resolution (EW_{min} = 0.35Å) shows faint absorption lines from the host galaxy (CaII λ, λ3934,3968, G band λ4305, and MgI λ5175) at z = 0.243.

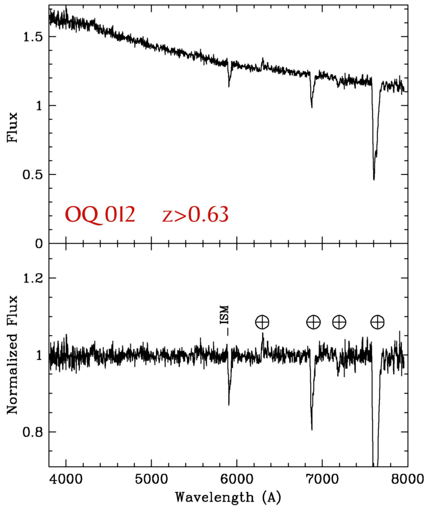

Fig. 2. ESO VLT optical spectrum of OQ 012, a radio-selected BL Lac object. Richards et al. (2004) gave a photometric redshift estimate z = 0.475. Our spectrum, obtained with high S/N (120) and spectral resolution (EW_{min} = 0.31Å) shows an absorption line by Galactic ISM (NaI λ5891), but no intrinsic features. More details on these two plus other 10 BL Lacs are presented in Sbarufatti et al. (2008).

P77 run data are completely analyzed and detailed results are presented in Sbarufatti et al. (2008). From P77 data we confirm the BL Lac classification on 12 new blazar-candidates.

New redshifts are determined for 4 objects, 2 with weak emission lines (PKS 1057-79, z = 0.569; TXS 2346+052, z = 0.419) and 2 with absorptions from the host galaxy (RBS 1752, z = 0.449; RBS 1915, z = 0.243, see Fig. 1).

The remaining 8 BL Lacs observed (PKS 0019+058, GC 0109+224, RBS 0231, OM 280, OQ 012 reported in Fig.2, PMN J1539-0658, PKS 1830-589, 1RXS J235730.1-171801) show very featureless spectra and absence of absorption lines of the host galaxy. For these targets lower limits to the redshift are deduced (z_{min} between 0.20 and 0.80). Detailed description of the adopted techniques and results are reported in Sbarufatti et al. (2008)[1].

[1] All spectra of our program can be retrieved at: `http://www.oapd.inaf.it/zbllac/`

Acknowledgements. Based on observations collected at the European Organization for Astronomical Research in the Southern Hemisphere, Chile. Prop./Run: ESO 077.B-0045.

References

Chavushyan V., Mujica R., Gorshkov A.G., Konnikova V.K., & Mingaliev M.G. 2000, Astron. Lett., 26, 339

Richards, G.T., Nichol R.C., Gray A.G. et al. 2004, ApJS, 155, 257

Sbarufatti B., Treves A., Falomo R., Heidt J., Kotilainen J., & Scarpa R. 2005, AJ, 129, 559

Sbarufatti B., Treves A., Falomo R., Heidt J., Kotilainen J., & Scarpa R. 2006, AJ, 132, 1

Sbarufatti B., Ciprini S., Kotilainen J., Decarli R., Treves A., Veronesi A., & Falomo R. 2008, AJ, submitted