

ESO VLT optical spectroscopy of BL Lac objects

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Using ESO VLT plus FORS 1 for spectroscopy of BL Lac objects of unknown z , we measured the redshift of 4 targets and lower limits for 8 others.

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Observations, analysis and results

We present results of an ongoing program at the ESO VLT plus FORS 1 for high S/N spectroscopy of BL Lac objects lacking of a firm redshift estimate, performed in non optimal seeing conditions (see Sbarufatti et al. 2005^[1], 2006^[2]).

We report on 12 new sources for which we confirm the BLL classification. 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 Table 1 and Figure 1.

For the remaining 8 BL Lacs, from the very absence of absorption lines of the host galaxy, lower limits to the redshift are deduced with z_{min} in the interval 0.20 - 0.80, see Sbarufatti et al. 2006^[2] and Table 2.

A detailed description of the adopted techniques and results is contained in Sbarufatti et al. 2008^[3]. All the spectra of our program can be retrieved at <http://www.oapd.inaf.it/zbllac/>.

Object name	redshift
PKS 1057-79	$z = 0.569$
RBS 1752	$z = 0.449$
RBS 1915	$z = 0.243$
TXS 2346+052	$z = 0.419$

Table 1: Redshifts for BL Lac objects

Object name	lower limits to the redshift
PKS 0019+058	$z > 0.4$
GC 0109+224	$z > 0.2$
RBS 0231	$z > 0.4$
OM 280	$z > 0.2$
OQ 012	$z > 0.5$
PMNJ 1539-0658	$z > 0.8$
PKS 1830-589	$z > 0.5$
1RXS J235730.1-171801	$z > 0.6$

Table 2: Lower limits to the redshifts for BL Lac objects without spectral features

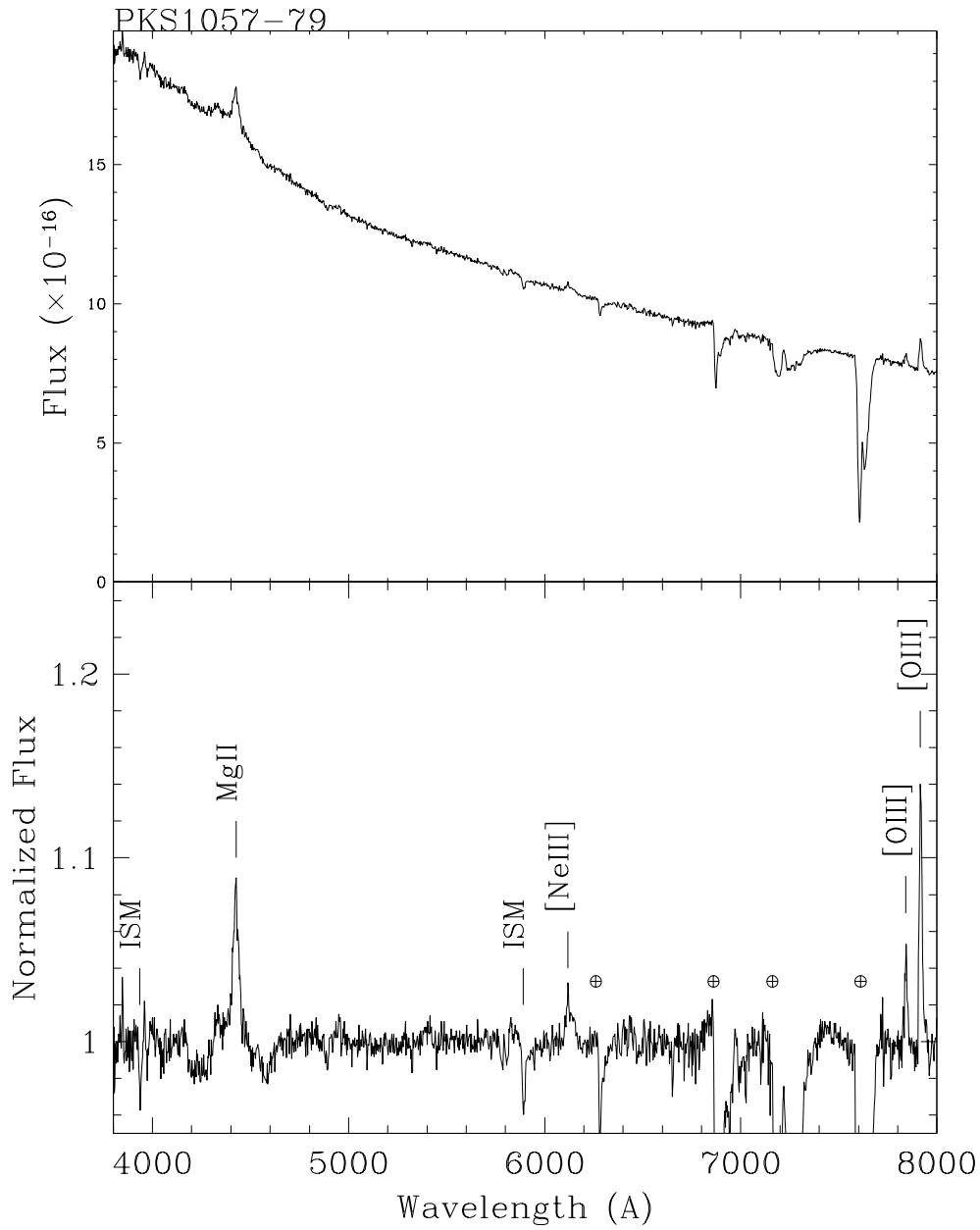
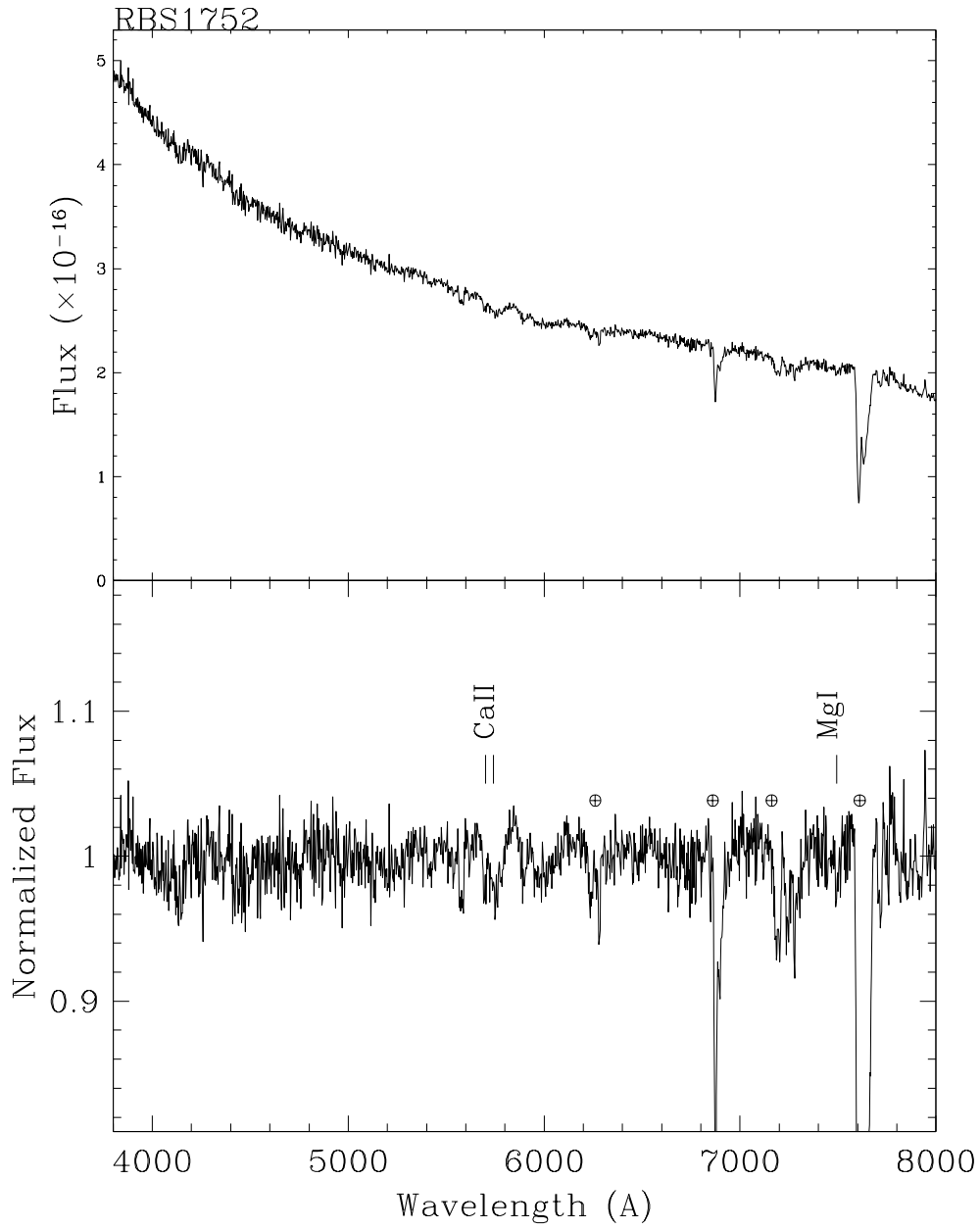
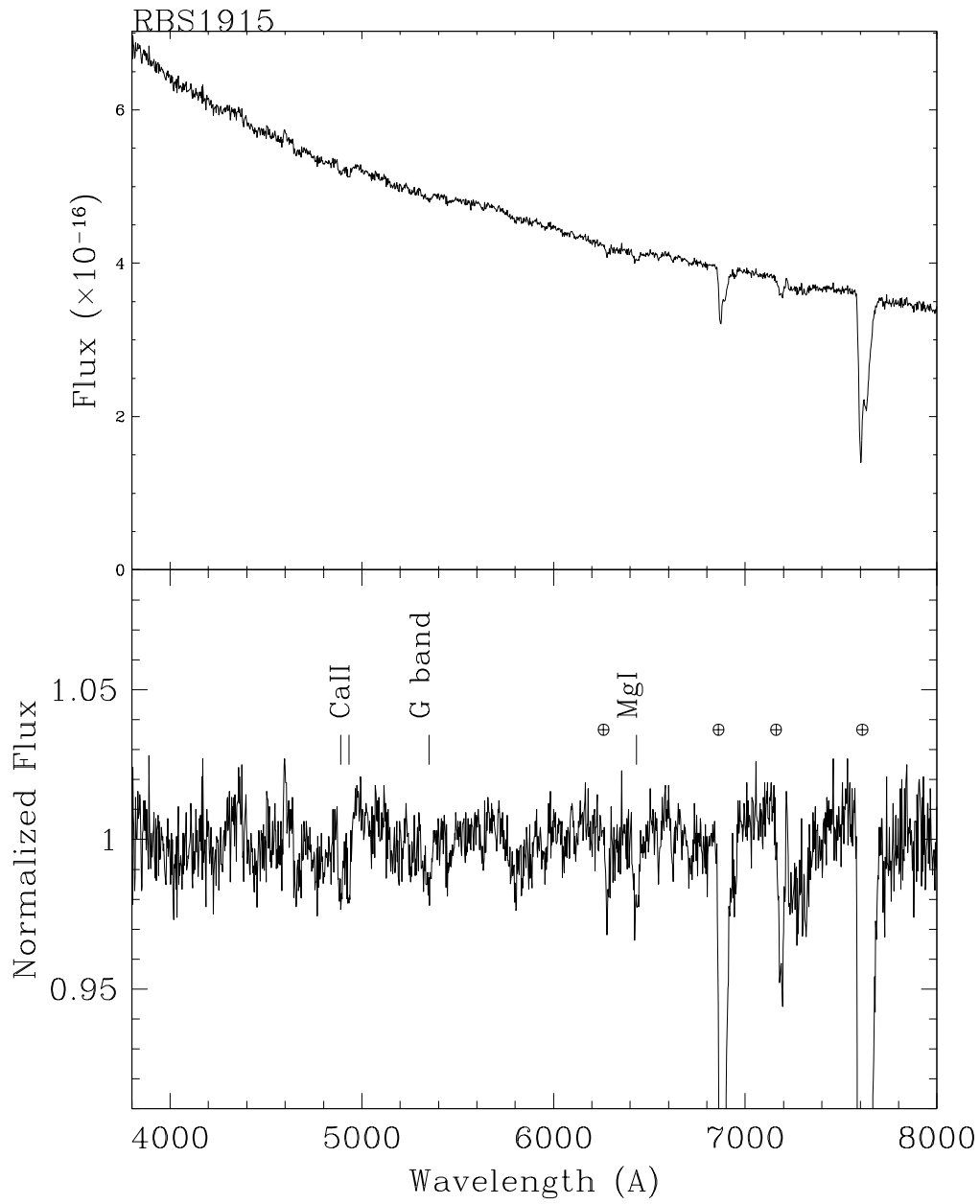


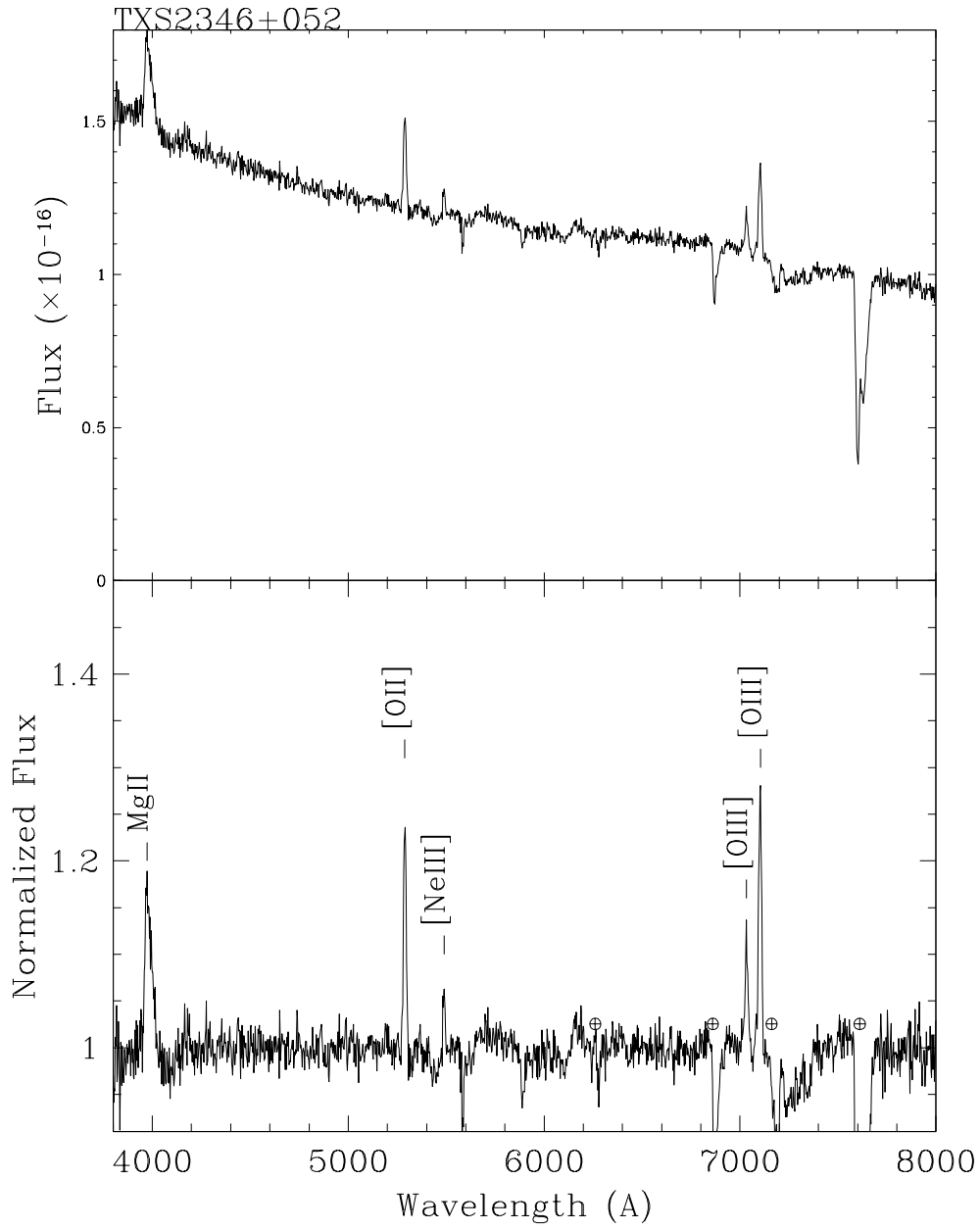
Figure 1: Top panels: flux calibrated dereddened spectra; the flux is measured in units of $\text{erg}/\text{cm}^2/\text{s}/\text{\AA}$. Bottom panels: normalized spectra. Telluric bands are indicated by \oplus , spectral features are marked by the line identifications.



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Figure 1: –continued.

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References

- [1] B. Sbarufatti, A. Treves, R. Falomo, J. Heidt, J. Kotilainen, R. Scarpa, *ESO Very Large Telescope optical spectroscopy of BL Lacertae. I. New redshifts*. *AJ* **2005** (129) 559
- [2] B. Sbarufatti, A. Treves, R. Falomo, J. Heidt, J. Kotilainen, R. Scarpa, *ESO Very Large Telescope optical spectroscopy of BL Lacertae. II. New redshifts, featureless objects, and classification assessments*. *AJ* **2006** (132) 1
- [3] B. Sbarufatti, S. Ciprini, J. Kotilainen, R. Decarli, A. Treves, A. Veronesi, R. Falomo, *ESO VLT optical spectroscopy of BL Lacertae objects. III. An extension of the sample*. **2008 AJ in press**.