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J/A+A/601/A32 10 SALT spectra of HE 0435-4312 (Sredzinska+, 2017)

SALT long-slit spectroscopy of HE 0435-4312:  
fast displacement in the Mg II emission line.

Sredzinska J., Czerny B., Hryniewicz K., Krupa M., Kurcz A., Marziani P.,  
Adhikari T.P., Basak R., You B., Wang J.M., Hu C., Pych W., Bilicki M.  
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=[2017A&A...601A..32S](#) (SIMBAD/NED BibCode)

**ADC\_Keywords:** QSOs ; Galaxies, optical ; Spectroscopy

**Keywords:** accretion, accretion disks -  
black hole physics, emission line, quasar - individual: HE 0435-4312

**Abstract:**

The MgII emission line is visible in the optical band for intermediate redshift quasars ( $0.4 < z < 1.6$ ) and it is thus an extremely important tool to measure the black hole mass and to understand the structure of the Broad Line Region.

We aim to determine the substructure and the variability of the MgII line with the aim to identify which part of the line comes from a medium in Keplerian motion.

Using the Southern African Large Telescope (SALT) with the Robert Stobie Spectrograph (RSS) we performed ten spectroscopic observations of quasar HE 0435-4312 ( $z=1.2231$ ) over a period of three years (Dec 23/24, 2012 to Dec 7/8, 2015). Both the MgII line and the FeII pseudo-continuum increase with time. We clearly detect the systematic shift of the MgII line with respect to the FeII over the years, corresponding to the acceleration of  $104 \pm 14 \text{ km/s/year}$  in the quasar rest frame. The MgII line shape is clearly non-Gaussian but single-component, and the increase in line equivalent width and line shift is not accompanied with significant evolution of the line shape. We analyse the conditions in the MgII and FeII formation region and we note that the very large difference in the covering factor and the turbulent velocity also support the conclusion that the two regions are spatially separated. The measured acceleration of the line systematic shift is too large to connect it with the orbital motion at a distance of the Broad Line Region (BLR) in this source. It may imply a precessing inner disk illuminating the BLR. Further monitoring is still needed to better constrain the variability mechanism.

**Description:**

Ten spectra of the quasar HE 0435-4312 taken at different dates with SALT telescope. Spectra are in the rest frame, corrected for the Galaxy extinction.

The ten spectra are taken on 23 Dec 2012, 18 Feb 2013, 20 Aug 2013, 3 Feb 2014, 23 Aug 2014, 24 Nov 2014, 9 Jan 2015, 9 Aug 2015, 6 Oct 2015, 7 Dec 2015.

**Objects:**

```
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RA      (2000)  DE      Designation(s)
-----
04 37 11.78  -43 06 04.3  HE 0435-4312 = HE 0435-4312
-----
```

**File Summary:**

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
<a href="#">table1.dat</a>	90	10	Log of spectroscopic observations with SALT
<a href="#">he0435.dat</a>	47	13	HE 0435-4312 broad band spectrum
<a href="#">obs01.dat</a>	29	1013	HE 0435-4312 spectrum, 23 Dec 2012
<a href="#">obs02.dat</a>	29	1004	HE 0435-4312 spectrum, 18 Feb 2013
<a href="#">obs03.dat</a>	29	1024	HE 0435-4312 spectrum, 20 Aug 2013
<a href="#">obs04.dat</a>	29	1015	HE 0435-4312 spectrum, 03 Feb 2014
<a href="#">obs05.dat</a>	29	1008	HE 0435-4312 spectrum, 23 Aug 2014
<a href="#">obs06.dat</a>	29	1027	HE 0435-4312 spectrum, 24 Nov 2014
<a href="#">obs07.dat</a>	29	1021	HE 0435-4312 spectrum, 09 Jan 2015
<a href="#">obs08.dat</a>	29	1012	HE 0435-4312 spectrum, 09 Aug 2015
<a href="#">obs09.dat</a>	29	1021	HE 0435-4312 spectrum, 06 Oct 2015
<a href="#">obs10.dat</a>	29	1016	HE 0435-4312 spectrum, 07 Dec 2015

**Byte-by-byte Description of file:** [table1.dat](#)

Bytes	Format	Units	Label	Explanations
1- 2	I2	---	No	Observation number
4- 14	A11	"date"	Obs.Date	Observation date
16- 22	F7.2	d	MJD	Modified Julian date of observation
24- 35	A12	s	ExpTime	Exposure time(s)

37- 43	A7	<a href="#">arcsec</a>	Seeing	Seeing
45- 80	A36	---	Com	Comments
82- 90	A9	---	FileName	Name of the file with spectrum

**Byte-by-byte Description of file:** [he0435.dat](#)

Bytes	Format	Units	Label	Explanations
1- 15	E15.10	<a href="#">[Hz]</a>	lognu	Rest frame (z=1.2231)
17- 31	E15.10	<a href="#">[mW/m2]</a>	lognuLnu	Rest-frame luminosity $\nu L_\nu$
33- 47	E15.10	<a href="#">[mW/m2]</a>	e_lognuLnu	rms uncertainty on lognuLnu

**Byte-by-byte Description of file:** [obs\\*.dat](#)

Bytes	Format	Units	Label	Explanations
2- 9	F8.3	<a href="#">0.1nm</a>	lambda	Observed frame (Wavelength)
12- 19	F8.3	<a href="#">ct/s</a>	Fobs	Observation flux
21- 29	F9.3	<a href="#">ct/s</a>	Fbckg	Background flux



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(End) Patricia Vannier [CDS] 24-Apr-2017

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