EUROPEAN SOUTHERN OBSERVATORY

Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

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APPLICATION FOR OBSERVING TIME PERIOD: **79A**

Important Notice:

By submitting this proposal, the PI takes full responsibility for the content of the proposal, in particular with regard to the names of COIs and the agreement to act according to the ESO policy and regulations, should observing time be granted

1. Title Category: **D–8**

Spectroscopy of faint cataclysmic variables discovered by the Sloan Digital Sky Survey

2. Abstract

There are not yet enough observations of cataclysmic variables (CVs) discovered by the Sloan Digital Sky Survey (SDSS). We are going to participate in a research programme to measure the orbital periods of SDSS CVs (Gansicke 2005; Gansicke et al. 2006; Dillon et al., in preparation) in order to assess whether the study of a less biased sample of CVs can reconcile observations with theories of the evolution of interacting binary stars. We have selected 5 targets from the SDSS catalog of CVs (Szkody et al. 2003.,2004.,2006.), and we would like to perform the same kind of measurements with FORS2, like J. Southworth (et al.) in early 2006, to enrich our data on CVs.

3.

Run	Period	Instrument	Time	Month	Moon	Seeing	Sky Trans.	Obs.Mode
A	79	FORS2	30h	jun	d	$\leq 0.8''$	PHO	s

4.

Number of nights/hours	Telescope(s)	Amount of time
a) already awarded to this project:	-	-
b) still required to complete this project:	-	-

5. Special remarks:

-

6. Principal Investigator: P. I. Papics (ELTE University, OTHER, papics@elte.hu)

CoI(s): Gy. Kerekes (ELTE University, OTHER), L. Molnar (ELTE University, OTHER)

7. Is this proposal linked to a PhD thesis preparation? State role of PhD student in this project

Yes / Gy. Kerekes. Data important for PhD thesis and student will participate in the project / mid-course

8. Description of the proposed programme

A) Scientific Rationale: Cataclysmic variables (CVs) are interacting binary stars containing a white dwarf primary star and a low-mass secondary star in a close orbit. Due to numerous difficulties (see J. Southworth et al. 2006.), detailed observational population studies are of great importance to provide the constraints necessary to further develop the theory of compact binary evolution. The currently known population of CVs is afflicted by several strong biases which makes the characterization of the true population and a comparison with models extremely difficult. The SDSS CV population is both more homogeneous and on average fainter than the currently known sample of CVs. It is therefore expected to contain more short-period systems, and may include a number of intrinsically faint CVs which have evolved beyond the period bounce. Previous measurements (J. Southworth et al. 2006.) showed that orbital periods of SDSS CVs are close to the observed 75-80 min minimum period for CVs (for the majority of examined objects), indicating that the properties of the population of these objects discovered by SDSS are substantially different to those of the CVs found by other means. We did not attempt to carefully select a representative sample of objects because the goal of the research project we are participating in is to (eventually) measure the orbital periods of all of the SDSS CVs with unknown periods. Our ongoing research programme of CVs discovered by the SDSS will give orbital periods of a larger homogeneous sample of these systems, allowing us to accurately assess the biases affecting the observed sample of CVs and so accurately measure the properties of the intrinsic population of these objects.

B) Immediate Objective: To make phase-resolved spectroscopy of five CVs recently discovered in SDSS spectroscopic survey observations. Precise orbital periods using radial velocities (to be measured from the wings of the H beta emission line) will be obtained.

C) Telescope Justification: VLT is needed mainly because the low brightness of the targets, its unique spectroscopical equipment, and to gain homogeneous data – see previous observation with the same telescope.

D) Observing Mode Justification (visitor or service): To improve our observing efficiency a carefully elaborated programm is used that does not require real-time decisions at the telescope. Particular scheduling parameters will be provided during Phase 2 Service-Mode proposal preparation.

E) Strategy for Data Reduction and Analysis: Data reduction and analysis processes that are presented by J. Southworth in "VLT/FORS spectroscopy of faint cataclysmic variables discovered by the Sloan Digital Sky Survey" will be used. – Radial velocities are measured from the hydrogen emission lines by cross-correlation with single- and double-Gaussian functions. The measured radial velocities for each CV will be searched for periods using periodograms computed using the Scargle (1982), analysis of variance (AoV; Schwarzenberg-Czerny 1989) and orthogonal polynomial (ORT; Schwarzenberg-Czerny 1996) methods implemented within the TSA context in MIDAS.

9. Justification of requested observing time and lunar phase

Lunar Phase Justification: The best sky conditions are needed for the best efficiency and least time-consumption. It is also important because the targets are faint stars, and we need phase-resolved spectroscopy, so the exposure time to orbital period ratio is very important. The faint targets, the necessary phase-resolved spectroscopy and small exposure time to orbital period ratio also justifies the best conditions. Had we had only brighter nights, to collect sufficient amount of data to complete the research programm, more nights would be needed.

Time Justification: (including seeing overhead) Assuming an average airmass of 1.15, an average seeing of 0.8", no moonlight, and an average 2 hours for each object (including off-target times, etc.), calculating with three 10 hour long nights, we would have a sum of 4×39 and 51 observations with 480 and 360 sec exposure times respectively (calculation based on real observations of stars in the same magnitude range: J. Southworth et al. 2006.).

Time (in UT) shedule of one night: SDSS J1422 00:00-02:00 (13 frames with 480 sec exposure times + off–target time), SDSS J1601 02:00-04:00 (13 fr., 480 sec), SDSS J2047 04:00-06:00 (13 fr., 480 sec), SDSS J2154 06:00-08:00 (17 fr., 360 sec), SDSS J0027 08:00-10:00 (13 fr., 480 sec).

Calibration Request: Standard Calibration

10. Report on the use of ESO facilities during the last 2 years

No ESO facilities were used during the last 2 years (4 observing periods).

11. Applicant's publications related to the subject of this application during the last 2 years

No subject-related publications prepared yet.

12. List of targets proposed in this programme

Run	Target/Field	α(J2000)	δ(J2000)	ToT	Mag.	Diam.	Additional info	Reference star
A	SDSS J0026	00 26 03.80	−09 30 21.0	6.0	20.19		CV	
A	SDSS J1422	14 22 56.31	−02 21 08.1	6.0	19.84		CV	
A	SDSS J1601	16 01 11.53	+09 17 12.7	6.0	20.12		CV	
A	SDSS J2047	20 47 20.76	+00 00 07.7	6.0	19.40		CV	
A	SDSS J2154	21 54 11.13	−09 01 21.7	6.0	19.19		CV	

Target Notes: g magnitude values in table above
Target names are shown in an abbreviated form, full names consist of SDSS J+coordinates. Example: SDSS J0026 stands for SDSS J002603.80-093021.0

12b. ESO Archive - Are the data requested by this proposal in the ESO Archive (http://archive.eso.org)? If yes, explain why the need for new data.

No data are requested.

13. Scheduling requirements

3. Unsuitable period(s) of time

Run	from	to	reason
A	9-jun-07	11-jun-07	National Conference

14. Instrument configuration

Period	Instrument	Run ID	Parameter	Value or list
79	FORS2	A	LSS	GRIS 1200R+93