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Report on the last two runs of the ESO LP 185.D-0056 (HARPS@3.6m)

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EXECUTIVE SUMMARY.

The ESO Large Programme 185.D-0056 (HARPS@3.6m) has finished in January 2013, a few months after the CoRoT fatal malfunction. We report here on the observations performed in June-July 2012 and December 2012-January 2013.

1. Introduction

The ground-based spectroscopic monitoring of the CoRoT targets continued in June and July 2012 and finished in January 2013. Only European Southern Observatory (La Silla, Chile; HARPS@3.6m) has been involved in the observations.

2. The ESO observations in June-July 2012

Ennio Poretti (INAF-OA Brera) was the observer for the first 10-nights run (June 24-July 5, 2011; the 28-29 June night belongs to another LP), Juan Carlos Suarez (IAA Granada) for the second 5-nights run (July 23-28, 2012). The HARPS observations were related to the LRc09 (April 10-July 5, 2012) and LRc10 (July-September 2012) runs. The CoRoT targets were:

- *LRc09*: HD 179079 (solar-like star, 7.96, G5), HD 178484 (red giant, 6.56, K0), HD 178169 (8.43, A3), HD 179192 (8.31, B8), and HD 178243 (8.71, A0);
- *LRc10*: HD 169689 (eclipsing red giant, 5.65, G8III+B), HD 169822 (solar-like, 7.78, G7), HD 170133 (δ Sct, 8.5, A2), HD 170270 (K5 giant, 7.4), and V585 Oph (semiregular variable, M6, $V > 8.8$).

The primary targets of the CoRoT observations were the planet-hosting, solar-like star HD 179079, observed to detect the reflected light, if any, and the eclipsing binary HD 169689. At least one spectrum was taken for any of the other targets (Table 1). Two other CoRoT targets were observed. They are HD 170200 (LRc07+LRc08, upon request from C. Aerts and P. Degroote) and HD 172046 (LRc02, from P. De Cat). The calibration star HD 135240 was observed both in HAM and EGGs mode at the beginning of the night to better define the blaze function.

Several filling/backup programs were also used, since pointing restrictions occurred several times. In addition to HD 91024 (P.I. C. Aerts, 2+5=7 spectra on 7 nights), 18 Sco (230 spectra on 7 nights in the 10-n run, agreed extension of a campaign chaired by M. Bazot), and GJ570B (15 spectra on the July 27 night, P.I. P. Amado), we observed:

SPB stars (P.I. P. De Cat) – HD 163899 (2 spectra on the first night) and HD 172910 (1 spectrum on the first night).

δ Sct stars (P.I. E. Poretti) – *June 24*: HZ Vel, NT Hya, MP Vel, MT Vel, V344 Vel, V527 Car, V743 Cen, and V388 Pav (first spectrum). *June 25*: AK Ant and V668 CrA. *June 26*: V336 Vel and HD 1015513. *June 27*: RX Sex, IW Vel, V947 Cen, V954 Cen, V950 Cen (first spectrum), and HD 104036. *June 29*: AZ Ant. *June 30*: V353 Vel and SU Crt. *July 1*: VY Crt, HD 120500, MX Vir, and V388 Pav (second spectrum). *July 2*: HD 129231, V853 Cen (2 spectra), IO Lup, BT Cir, and IN Lup. *July 4*: V950 Cen (second spectrum) and MP Hya. *July 24*: V922 Sco. All the above stars were observed in the EGGs mode. The slow rotators HD 184552 (4+11=15 spectra on 7 nights), HD 16189 (6+19=25 spectra on 8 nights) were observed more intensively in HAM mode.

WASP stars (P.I. A. Triaud) – A few stars were observed on an exchange basis with the ESO LP 089.C-0151, as agreed with ESO. They are: WASP-69 \equiv SW2100-0505 (2 spectra on June 24), WASP-70 \equiv SW2101-1325 (1 spectrum on June 25, 1 on June 26, 1 on June 29, 1 on June 30, 1 on July 1), WASP-8 \equiv SW2359-3501 (1 spectrum on June 29, 1 on June 30), and WASP-53 \equiv SW0207-2039 (1 spectrum on June 29, 1 on June 30).

3. The ESO observations in December 2012 and January 2013

The last HARPS runs of the ESO LP185.D-0056 were scheduled from December 10, to 20, 2012 and from December 31, 2012 to January 5, 2013. Valentina Schmid (Leuven University) and Marco Scardia (Brera Observatory) were the observers. The first three hours of the 19-20 Dec night were lost for high

Table 1. Number of spectra collected in the ESO runs in June and July 2012

LRc09 and LRc10 targets					
	Mode	10-n run	5-n run	Total	
HD 179079	HAM	259	2	261	
HD 178484	HAM	93	53	146	
HD 169689	HAM	107	48	155	
HD 178169	EGGS	23	4	27	
HD 170133	EGGS	27	6	33	
HD 179192	EGGS	1	–	1	
HD 169822	HAM	–	115	115	
HD 170270	HAM	–	1	1	
HD 178243	EGGS	1	–	1	
V585 Oph	EGGS	–	1	1	
Targets other runs					
HD 170200	HAM	8	2	10	
HD 172046	HAM	9	2	11	

umidity. The last three hours of the January 1-2 night lost for a technical failure of the telescope (oil pump).

The stars observed with CoRoT in the LRA09 pointing are HD 46375 ($V=7.84$, solar-like star with non-transiting planet; Gaulme et al. 2010, A&A 518, L153), HD 46202 ($V=8.20$, β Cep-like star; Briquet et al. 2011, A&A 527, A112), HD 46149 ($V=7.59$, $P_{rot} \sim 11$ d; Degroote et al. 2010, A&A 519, A38), HD 46150 ($V=6.75$; Blomme et al. 2011, A&A 533, A4), and HD 46223 ($V=7.32$; ibidem). All these stars were already observed in the SRa02 (Oct. 8-Nov. 11, 2008) and the quoted references give details about the analysis of the photometric data. However, only HD 46149 was previously observed in the HARPS spectroscopic programme.

The LRA09 stars were selected for the programme of this run and HD 46375 was considered as main target. We also added HD 46769 ($V=5.79$, observed in the LRA03, March 2010) and HD 45975 ($V=7.46$, observed in the SRa04, January 2012). The monitoring of these stars was very satisfactory (Table 2). We also planned to follow HD 43913 ($V=7.86$, observed in LRA03), but we were forced to put it aside since it was too much time consuming. The LRA09 started on early October 2012 and actually lasts one month only, since CoRoT stopped the observations in early November due to the second, fatal failure of the electronic chains.

The calibration star HD 34816 was observed both in HAM and EGGs mode at the beginning of the night to better define the blaze function. A limited filling programme was performed and restricted to HD 16031 ($V=9.85$, HAM mode, PI S. Desidera; 9+5=14 spectra), HD 290327 ($V=8.94$, HAM mode, PI S. Desidera; 7+0=7 spectra), HD 16189 ($V=7.00$, EGGs mode, PI N. Nardetto; 43+0=43 spectra), and HD 67523 ($V=2.81$, HAM mode, PI N. Nardetto; 0+356=356 spectra).

Table 2. Number of spectra collected in the last ESO runs in December 2012 and January 2013

LRA09 targets					
	Mode	10-n run	5-n run	Total	
HD 46375	HAM	777	383	1160	
HD 46202	EGGS	41	16	57	
HD 46149	EGGS	26	9	35	
HD 46150	EGGS	20	9	29	
HD 46223	EGGS	20	8	28	
Targets other runs					
HD 46769	HAM	46	16	62	
HD 45975	EGGS	1	1	2	