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The refurbishment of the Asiago Schmidt Telescope

R.U. Claudi[1], E. Bozzato[1], P. Bruno[2], L. Contri[1], G. Gianesini[1], L. Lessio[1], G. Martorana[1], M. Rebeschini[1], D. Strazzabosco[1]

[1] Istituto Nazionale di Astrofisica – Osservatorio Astronomico di Padova, Vicolo dell'Osservatorio 5, I-35122 Padova, Italy
[2] Istituto Nazionale di Astrofisica – Osservatorio Astrofisico di Catania, via di Santa Sofia 78, I-95123 Catania, Italy
e-mail: `claudi@pd.astro.it`

Abstract. The RATS project sets itself to search for giant exo – planets with the photometric transit method, exploiting the 67/92 Schmidt Telescope at Mount Ekar in Asiago neighbourhoud. The telescope underwent on a refurbishment and automation phase. The automation phase is already going on. We describe the status of the first phase of the project (telescope refurbishment) and the telescope capabilty in transit hunt.

Key words. Planets: exoplanets – Planets: transits – Methods:photometry

The Schmidt telescope of the Padova – Asiago Astronomical Observatory, built in 1967, is the larger Schmidt telescope in Italy (see Table 1). In about 30 years of duty, it impresses something like 17,000 photographic plates in direct imaging and with objective prisms, allowing the discover of several Super novae, novae and Asteroids. The sostituition of the plate holder with a flat mirror at the end of 2000 permitted to utilize a CCD Camera (Claudi et al. 2004). Wide field of view telescopes equipped with CCD cameras could monitor simultaneously a huge number of stars to search for planetary transit signatures in their light curves. The transit allows an estimate of the projected area of the planet and, hence, of its radius. Thus, if the planetary mass is known, it is possible to determine the density of the planet, its surface gravity and have hints about the atmospheric gas composition (escape velocity). In this framework we plan to utilize the 67/92 Schmidt telescope at C.ma Ekar (see Figure 1) as the main instrument for *RATS* (Radial velocities and Transit Search). In order to reach this goal we subject the Schmidt telescope to a major refurbishment, the first phase of which, ended in September 2004, include the implementation of the following items:

Send offprint requests to: R.U. Claudi

Table 1. The 67/92 cm M.^{nt} Ekar Schmidt Telescope optical characteristics

Correcting Plate	670 mm (UBK7)
Spherical Mirror	920 mm (Duran-50 Schott)
Focal Length	2150 (F/3.2)
Curvature Radius	(2150± 10) mm
Scale	95.94 arcsec/mm

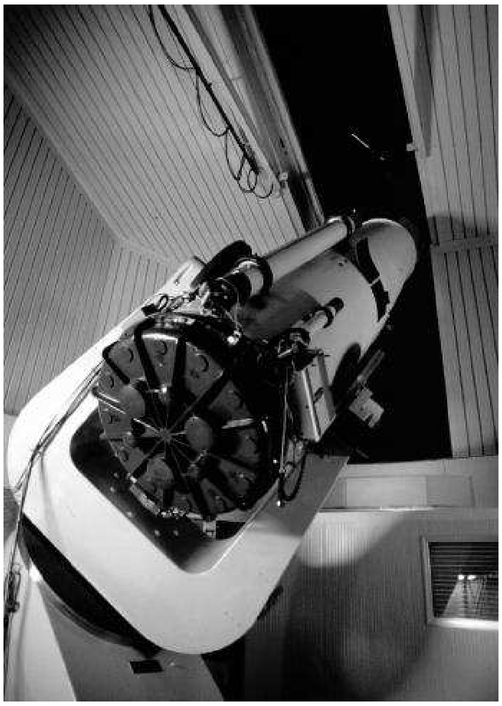

Fig. 1. The C.ma Ekar 67/92 Schmidt Telescope

- New motors, cabling and control electronics
- "Ex Novo" low level control software and closed loop pointing
- Remote telescope control and new control local network
- New control room
- Telescope User interface with classical pointing, personal catalog editor, personal catalog pointing and journal of observation
- Remote CCD focusing, auto – guide and seeing monitor
- Metereological Station (T, P, Hu, Solar Flux, Speed and wind Direction)

The next phases are planned to finish at the end of 2005 and include observation scheduler software process and automatic reduction data pipeline.

The main aim of the *RATS* project is twofold. The detection of extra solar planets that transit the disk of their parent star is the scientific drive of the whole project. We are planning to observe simultaneously thousands

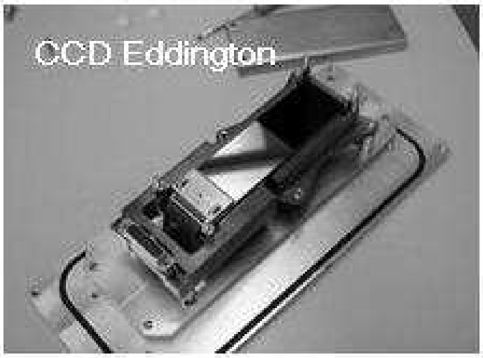

Fig. 2. One of the forecast CCDs for ESA space planetary transit search mission *EDDINGTON*

of stars (magnitude range between 9th to 14th) in selected star fields for five years since the beginning of 2005. In this manner we are confident to find 10 new transiting planets. In particular, because we plan to have spectroscopic follow up observation with a second telescope equipped with a fiber fed echelle spectrograph in order to recognize false alarms, we cannot use the whole photometric performance of the Schmidt telescope. As a compromise between the forecast alarm number (proportional to the quantity of observable stars) and the efficiency of the atmosphere – telescope –

spectrograph system, the fainter magnitude we observe is 13^{th} (goal 14^{th}). On the other hand we need to observe stars brighter than the 13^{th} (14^{th}) magnitude avoiding CCD saturation induced by the speed (F/3) of the telescope itself. For this reason we de – focalize the Schmidt telescope so that we can observe, with the necessary photometric precision, stars as bright as 9^{th} without saturation and stars as faint as 13^{th} (14^{th}) with an already usefull signal to noise ratio.

The second aim of the project is to use its observing strategy and the scientific data management as a bench work for future space mission searching for planetary transit. In order to achieve the latter goal, ESA loan to *RATS* one of the *e2V* frame transfer CCDs (2k$\times$ 6k with a pixel size of 13.5μm) forecast for the *EDDINGTON* space mission (see Figure 2). This CCD will be set up in the RATS

- Cam and successively mounted at the telescope in Fall 2005. In the meantime, in order to refine the mounting and testing procedure for RATS - Cam and to test the observing strategy, we employ two different CCD camera used at the telescope for previous experiments. In February 2005 we started with typical *RATS* observation following a selected star field with the ITANET CCD, a peltier cooled 2k× 2k KODAK chip (pixel size 9μm), set up in the COLD laboratory of INAF Catania Observatory. This CCD has been used during the refurbishment phase for NEOs and Solar System Minor Body observations. The field of view achieved with this camera was small but the ITANET CCD was usefull to obtain first images on which we can test automatic reduction pipeline. In April the ITANET camera has been substituted with a N_2 cooled SITe CCD (2k × 2k chip, pixel size 24μm) in order to have a larger field of view.

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