



Planetary Research Team



Extrasolari Live!



Crab Nebula Association



COELUM Astronomia

## XO-2b transit on 24th January 2008: tests results.

By Angelo Angeletti

EXTRASOLAR LIVE! Project intends to approach the great but inexperienced public who likes to visit our Observatories as astronomy “fans”, to the live watching of an extra solar planet transit. In details, on 27<sup>th</sup> February next (starting at 09.00 p.m.) many Italian and European Observatories will place their instrumentation at public’s disposal to “observe” XO-2b planet. XO-2b is a planet as large as Jupiter, orbiting at the distance of 5,5 millions Km around his star: located in the Linx constellation and 500 light years far from Earth, this star looks like the Sun being only a little younger. XO-2b planet will pass through the disk of its proper star, causing an eclipse “visibile” from Earth.

Extra solar planets discovery certainly infuse a great charm, and this is a sign of assured success for this event, also considering that almost every Observatories taking part in this project will broadcast the transit “live” though their web sites and through COELUM astronomy magazine web site.

Extra solar planet research began in 1995: at the moment we can enumerate about 300 successes. Certainly we are speaking about giant planets very close to their star, but we can suppose to find also planets looking like Earth .... and dreaming of extraterrestrial forms of life is an obvious consequence.

The discovery of Earth size extra solar planet should have enormous philosophic and cultural implication, so strong to justify capitals mankind is actually investing in this kind of research. Also an astronomy lover holding a convenient instrumentation (nowadays rather widespread) is possible to give his perceptible contribution to this kind of research. In the web site [www.crabnebula.it](http://www.crabnebula.it) you can find all material allowing to “see” an extra solar planet transit: Planetary Team began to make this kind of observation on Summer 2007.

Particularly, Monte d’Aria Astronomical Observatory produced a dedicated software named “TRel”, allowing to facilitate both shooting images and processing the star light curve during the transit. In order to be tested, software TRel is free delivered and in a few time a second release (modified in conformità with several request) will be ready.

On 24th January last, planet XO-2b passed through the disk of its proper star: also thanks to nice weather conditions in was possible to make some tests. Several Observatories tried to shoot the transit: here you can find the relative reports showing the light curves obtained with a short description of instrumentations and procedures utilized. Please note in some circumstances digital cameras and software different from TRel were used.

**Astronomical Observatory “Padre Francesco De Vico”  
Monte d’Aria – Serrapetrona (MC) – Italy**

**Authors: Angelo Angeletti, Fabiano e Francesco Barabucci, Gianclaudio Ciampechini**

**Instrumentation:**

- Newton Reflecting Telescope 410mm f/4,5;
- CCD ST7-ME cooled at  $-20^{\circ}$  (double autoguider sensor)



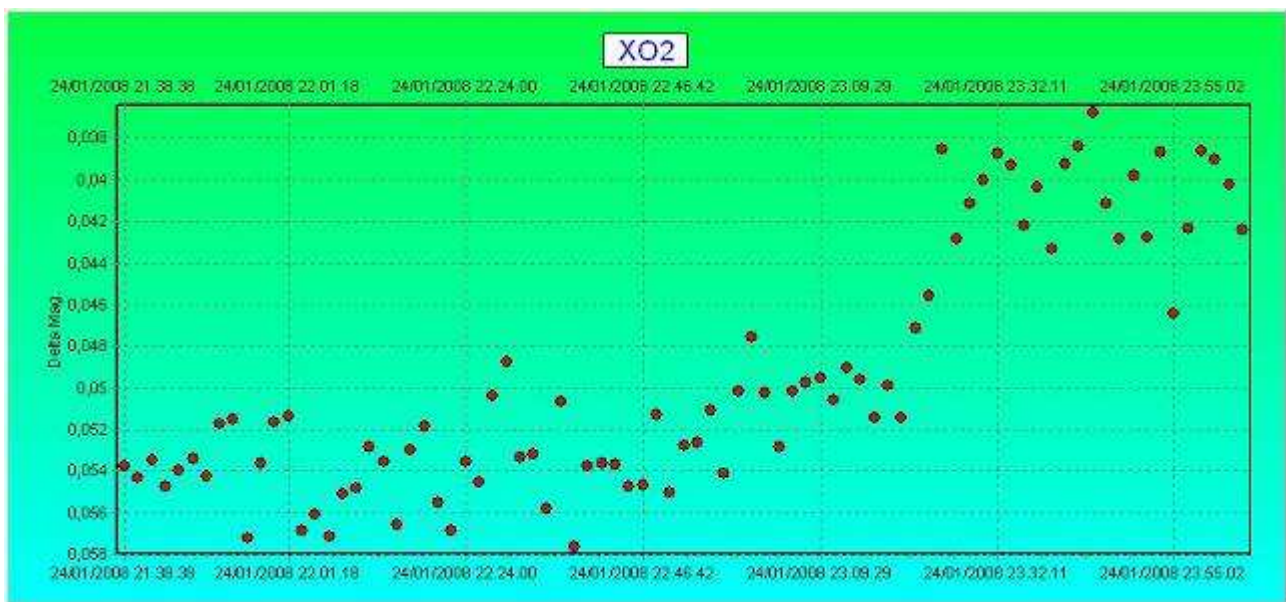
**Shooting:**

- Calibration:
  - 40 Flat Fields (1" exposure);
  - 40 Bias;
  - 20 Dark Frames (35" exposure)
- Transit images: 35" integrations, spaced out 70" (TRel processing length 10") for a total of 84 images (start at 21:38:38 UT, end at 00:03:46 UT).

**Processing software: TRel**

**REMARKS:** some problems didn't allow to shoot the transit from the beginning. Images automatically taken and processed through TRel. Dome position manually controlled.

**Light curve:**



## Centro Astronomico di Libbiano Peccioli (PI) – Italy

**Authors: Alberto Villa, Paolo Piludu, Enzo Rossi, Paolo Bacci, Emilio Rossi,  
Domenico Antonacci, Francesco Biasci**

### Instrumentation:

- Ritchey-Chretien 500mm f/8 reflecting telescope;
- CCD Finger Lakes FLI IMG cooled at  $-30,3^{\circ}$
- Guide Telescope: apochromatic refractor A&M 180mm m, f/9 placed in parallel and equipped with CCD Starlight SXVF-H5



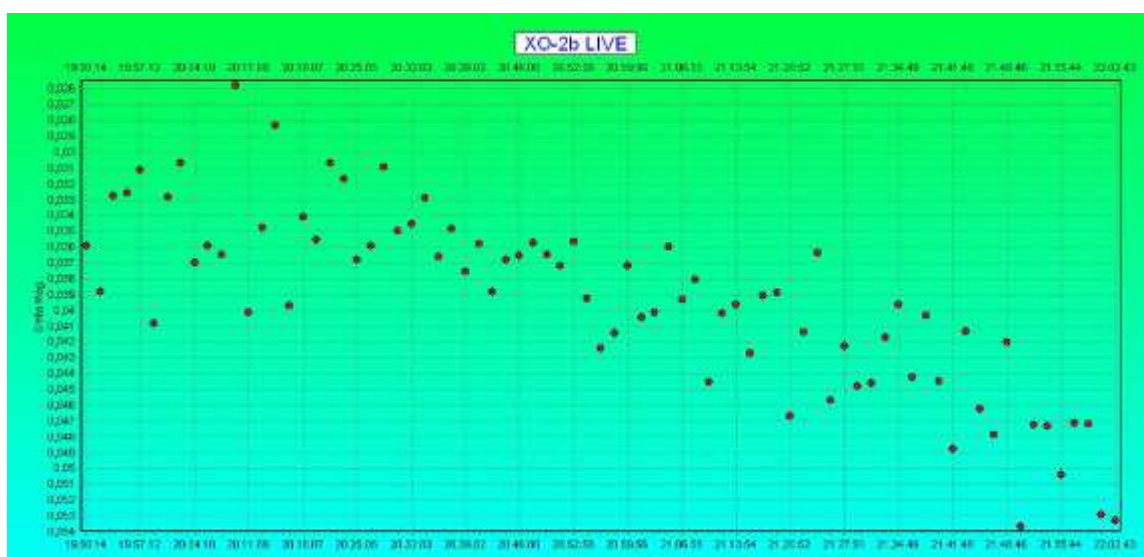
### Shooting:

- Calibration:
  - 50 Flat Fields (3" exp.) + 15 Bias + 15 Dark Frames (3" exp.)
  - Master Bias previously prepared.
  - Master Dark previously saved (same transit 60" exposure and CCD temperature).
- Transit images: 60" integrations spaced out da 30" for a total of 160 images (start at 19:50:14 UT, 4 hours shooting).

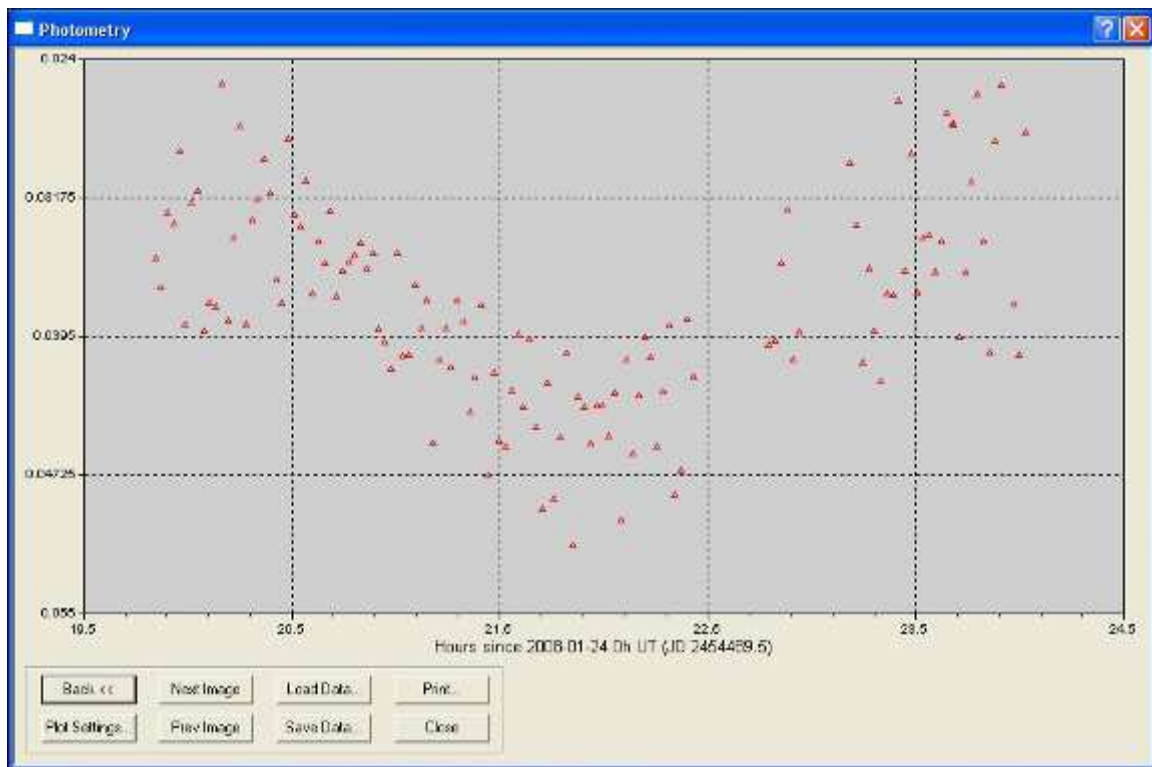
Processing software: TRel - Maxim DL

REMARKS: TRel correctly used till 22:02:43 TU, finding afterwards some. Processing data also through Maxim DL.

### Light curve:



Light curve till 22:02:43 TU, processed with TRel



Light curve processed with Maxim (images calibrated and saved using TRel)

# Astronomical Observatory “Pietro Dora Vivarelli” Capannoli (PI) – Italy

**Author: Paolo Bacci**

## Instrumentation:

- Telescope: Meade LX200 250mm, f/10, with focal reducer to f/6.3 (real focal length 1600mm);
- CCD ST7 (double autoguider sensor).



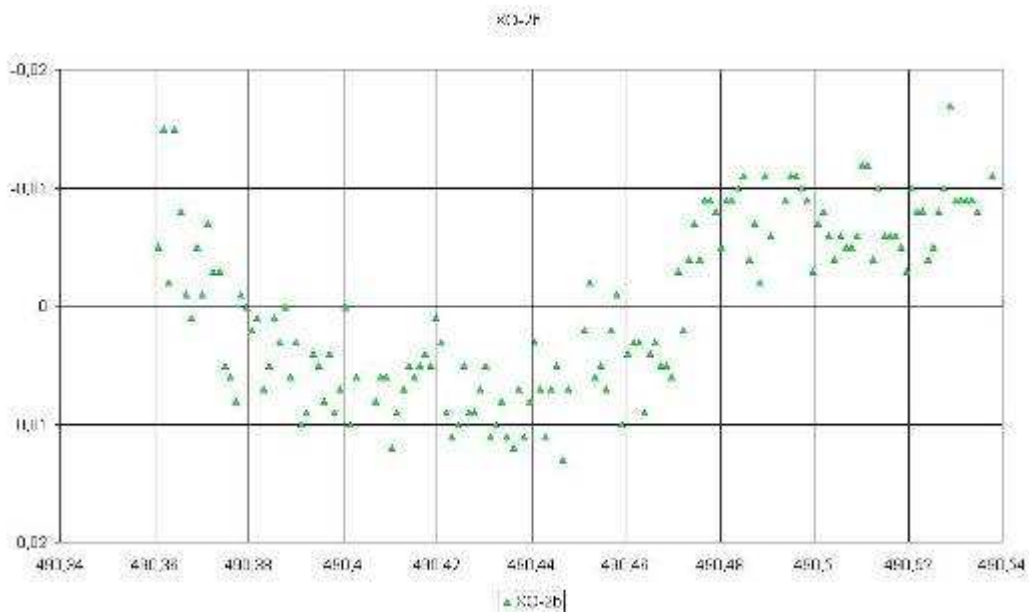
## Shooting:

- Calibration:
  - 30 Flat Field with relative Dark Frames
  - 19 bias
  - Only 5 Dark Frames (60” exposure)
- Transit images: 60” exposure spaced out 60”, for a total of 145 (start at 20:39:02 UT, end at 00:54:05 UT).

Processing software: Maxim DL and Excel

REMARKS: transit images automatically taken (the author was not near the observatory).

## Light curve:



## Personal Osservatory Pisa – Italy

Author: Gimmi Ratto

### Instrumentation:

- Telescope: Meade 8" (200mm);
- Canon 350D camera.

### Shooting:

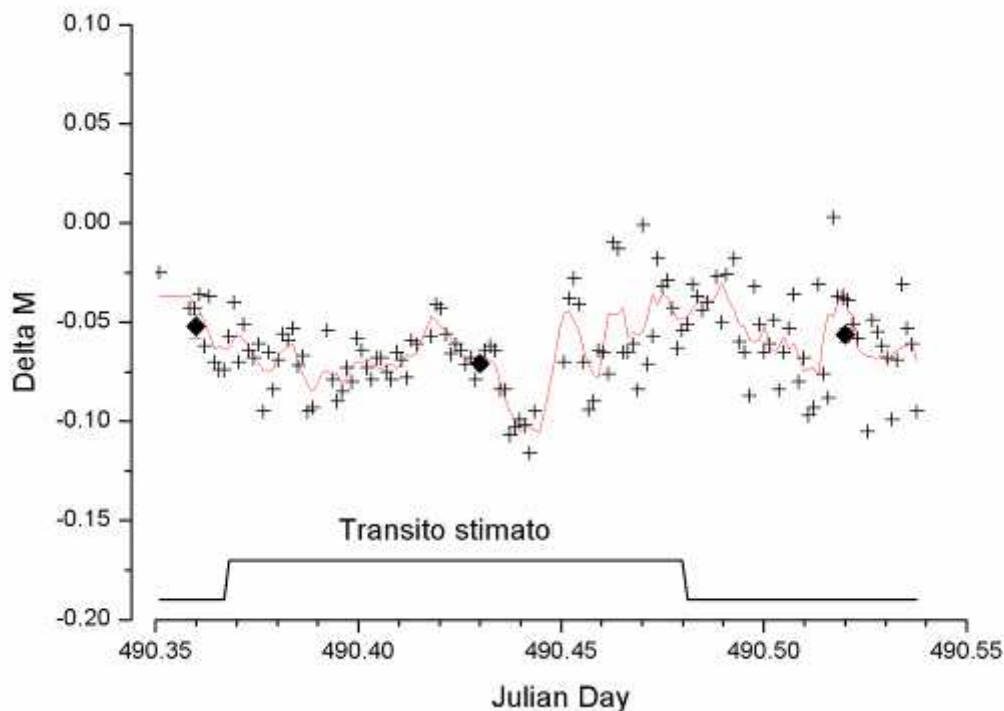
- Calibration: not specified.
- Transit images: not specified.

Processing software: not specified  
(different from TRel)



**REMARKS:** the author says: “transit shooting was a failure, notwithstanding that some test made in last December pointed out an RMS error of 0.01 magnitude about . The result of 24<sup>th</sup> January transit is shown in the following graphic. Delta M values between X0-2b and the reference star as averaged out in pre-transit, transit e post-transit suggest a  $0.017 \pm 0,0021$  magnitude depth. Differences are significant but not surely caused by the transit. Anyway the lighr curve is not good.

### Light curve:



# Astronomical Observatory at Siena University Siena – Italy

Authors: A.Borsi, M.Conti, A.Marchini, F.Marchini

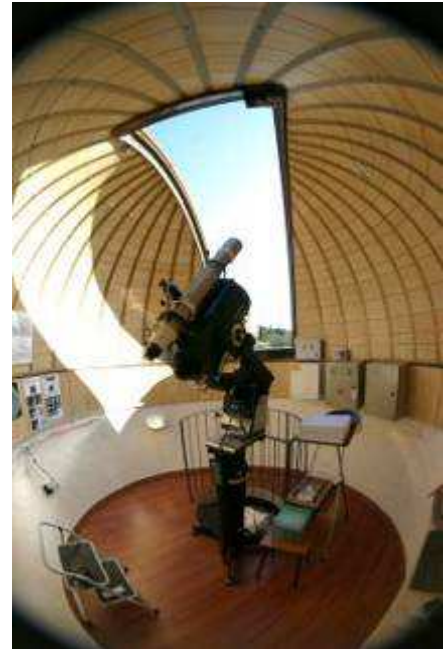
## Instrumentation:

- Telescope: Meade LX200 1600mm f/6.3, equipped with a V Johnson-Cousins (Schuler) filter;
- CCD Starlight Xpress SX-L8 (temperature between  $-24.0^{\circ}$  e  $-25.0^{\circ}$ )

## Shootings:

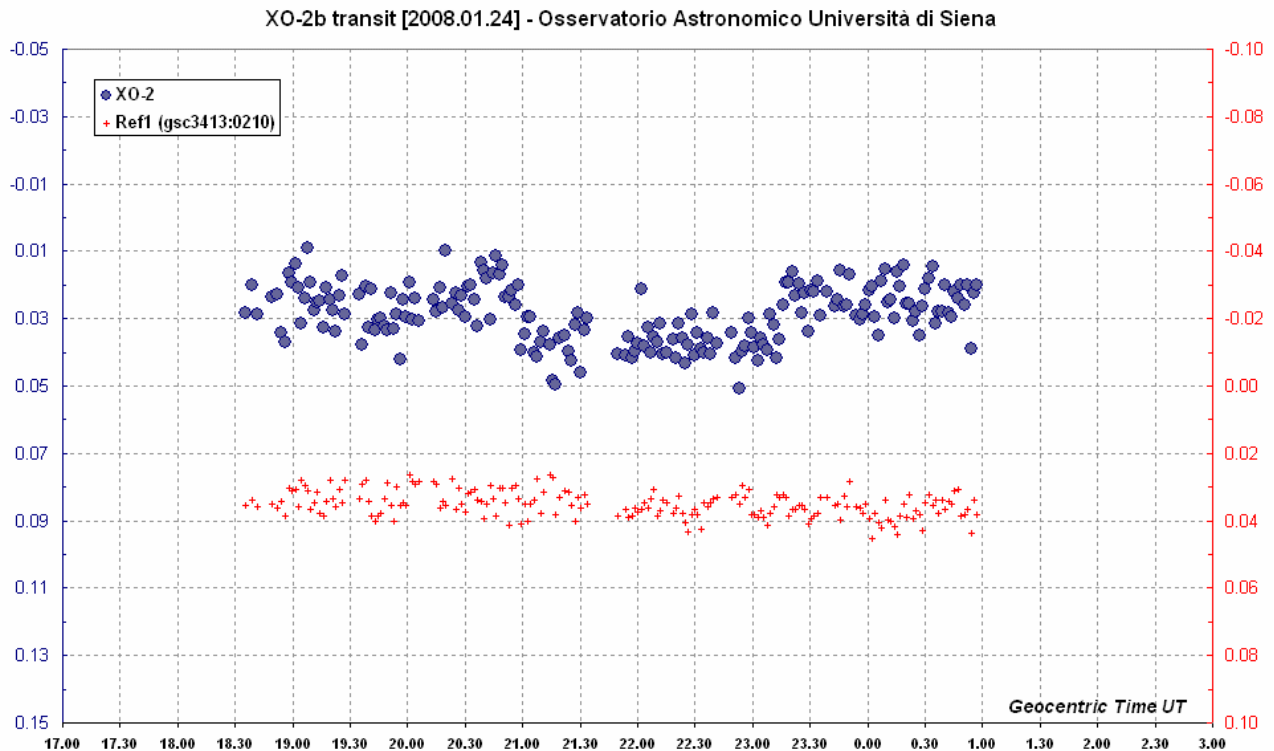
- Calibration: dark frames and flat-fields taken at the end of the event.
- Transit images: exposure time 90".

Processing software: Astroart for integrations, Maxim DL and Iris for data processing.



REMARKS: At work in the Observatory from 18.30 UT to 01.15 UT (25<sup>th</sup> January). Some problems with telescope tracking and insufficient SNR ratio in several images.

## Light curve:



**Astronomical observatory  
Carpione – Italy**

**Author: Riccardo Papini**

**Instrumentation:**

- Telescope: Meade LX200GPS 2540mm f/10.0, equipped with a R Johnson-Cousins (Schuler) filter;
- CCD SBIG ST9XE NABG cooled at  $-15^{\circ}$

**Shooting:**

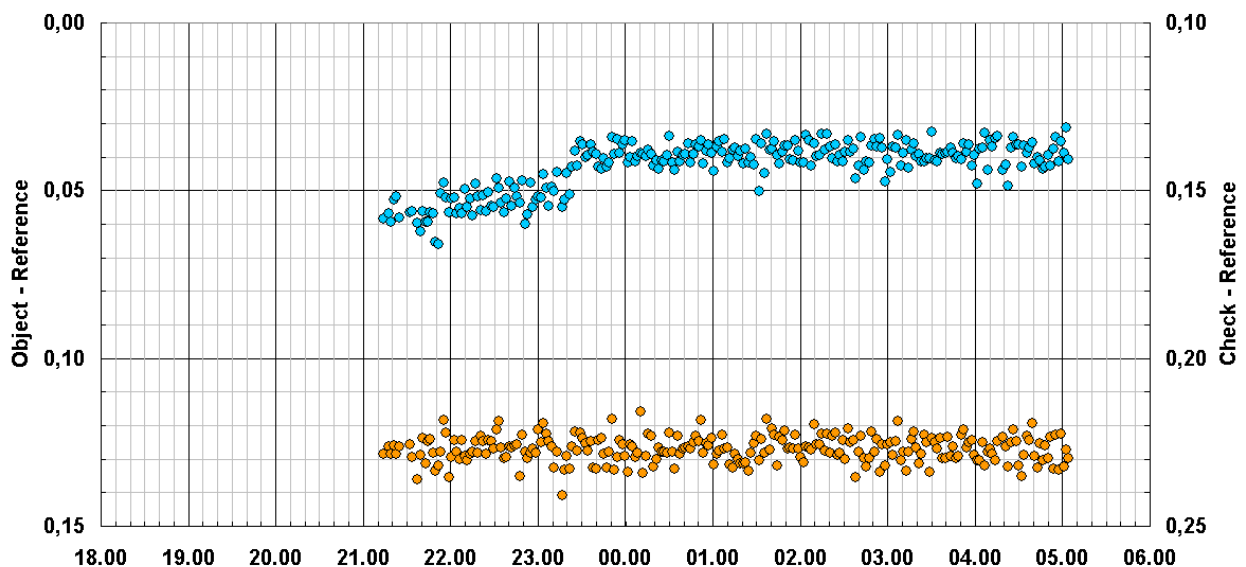
- Calibration: masterdark subtracted from images and dividing per masterflat (also dark subtracted)
- Transit images: 90'' exposure time spaced out 15'' (about 34 images per hour).

**Processing software:** CCDSOFT used for integration, Maxim DL for data processing.

**REMARKS:** some problems when aligning telescope delayed sequence starting. First 20 images taken with CCD at the temperature of  $-5^{\circ}$ . For the other images CCD temperature at  $-15^{\circ}$ .

**Light curve:**

Object XO2b - Night of 2008, 24 gen on 25 gen  
Check - Reference standard deviation = 0,039



**Municipal Astronomic Observatory  
S.Giovanni in Persicelo (BO) – Italy**

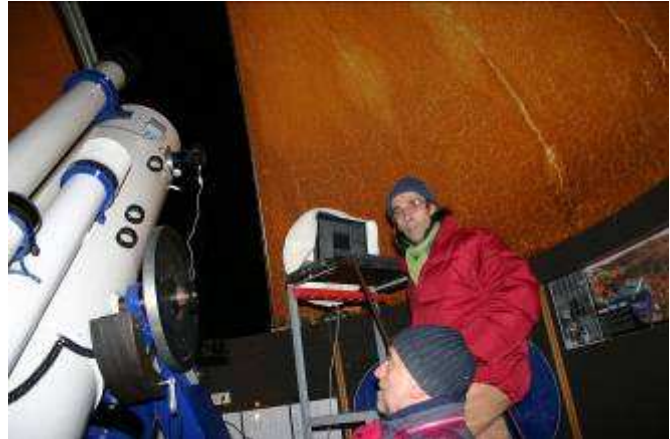
**Authors: Gilberto Forni e Valentino Luppi**

**Instrumentation:**

- Telescope: Newton 400mm f/5;
- Canon EOS 20DA at ISO 400

**Shooting:**

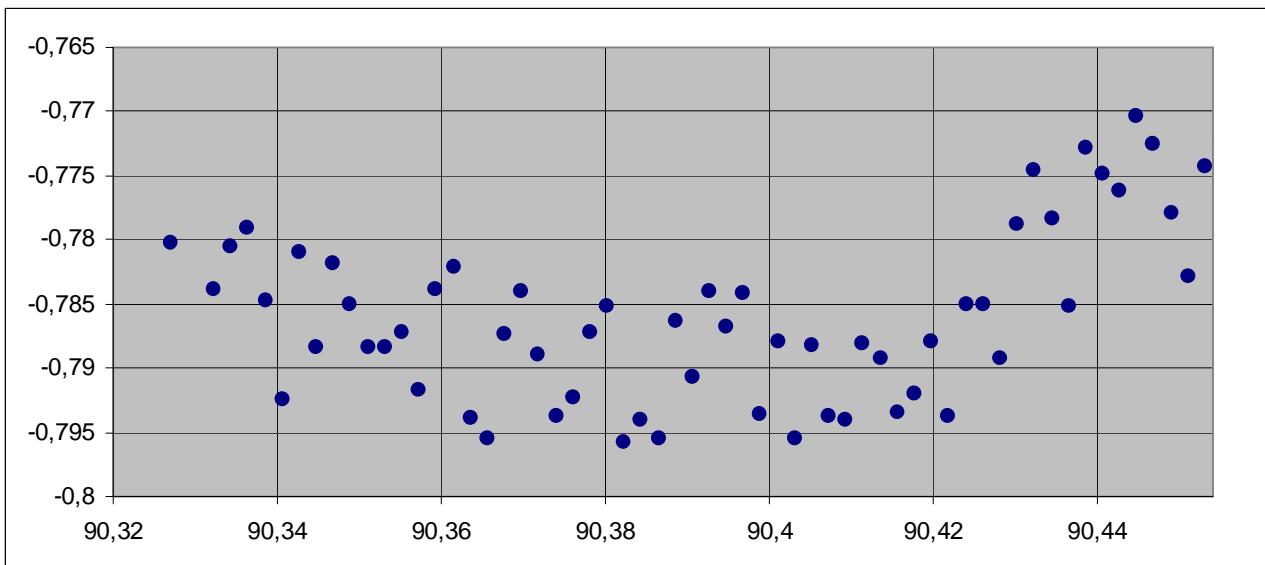
- Calibration: not specified.
- Transit images: 60" exposure time spaced out 120". Start at 20:58 UT; end at 00:52 UT



**Processing software:** not specified (different from TRel)

**REMARKS:** cause of technical reasons, transit shooting began 11 minutes late.

**Light curve:**



# Municipal Astronomical Osservatory S.Giovanni in Persicelo (BO) – Italy

**Authors: Gilberto Forni e Valentino Luppi**

## Instrumentation:

- SkyWatcher refractor telescope (80mm diameter - 700mm focal length);
- Canon EOS 350D camera (ISO 800)

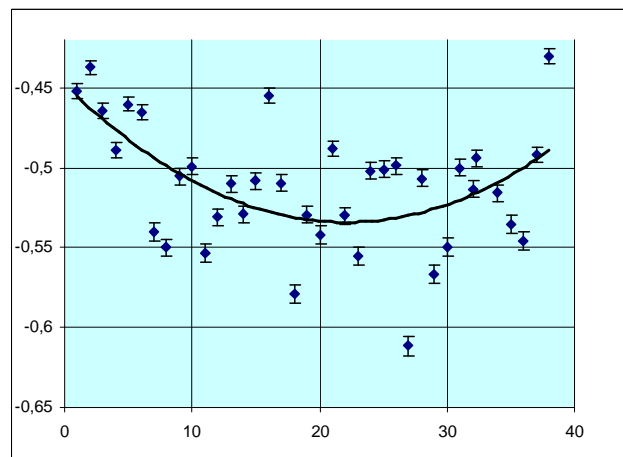
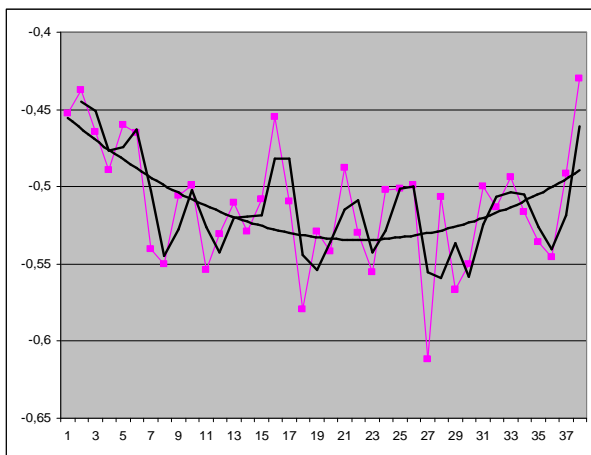
## Shooting:

- Calibration: not indicated.
- Transit images: 38 integrations (119" exposure time spaced out 120").

Processing software: not specified (different from TRel)

**REMARK:** very interesting outcome obtained using a little refractor telescope equipped with a standard digital camera!

## Light curve:



## Astronomical Observatory Lodigiano Mairago (LO) – Italy

**Authors: Fabio Zucconi, Gianluca Manenti, Enrico Tamagni e Tiziano Coccoli  
del Gruppo Astrofili M42**

### Instrumentation:

- Schmidt Cassegrain telescope, diameter 300mm, f/6.7
- CCD Starlight Xpress Mx7C
- Autoguider: Starlight Mx5 applied to a 100mm refractor placed in parallel.



### Shooting:

- Calibration: no. 100 Flat Fields, no. 100 Bias and no 50 Dark Frames.
- Transit images: 20" exposure time, starting at 20:00 UT – end at 00:30 UT

Processing software: Maxim DL (no TRel)

**REMARK:** very thin clouds were hiding the stars about one hour after shooting. Images taken during last 30 minutes are not shown in the following light curve cause of problems with the autoguider.

### Light curve:

