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Centro Astronomico di Libbiano – MPC Code B33
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Observation date: 14th February 2008

**SHOOTING OF EXTRASOLAR PLANET XO-2b TRANSIT
ON 14th FEBRUARY 2008
(R.A. 07h 48m 07s - Decl. 50° 13' 33")**

This observation at “Centro Astronomico di Libbiano” has been organized with the following purposes:

- to shoot the XO-2b extrasolar planet transit on 14.02.2008 (event beginning at 19:01 TU – ending at 21:47 TU);
- to test software TRel (by Fabiano Barabucci, got from PRT - Planetary Research Team) purposely planned to follow image after image (in real time) the brightness fluctuation of the star concerned with the transit during the event.
- to test the on-line web transmission (publicized by PRT to the involved Italian and European users) through the following web sites:
 - www.coelum.com
 - www.astrofilialtavaldera.com/live/live.html
 - www.robacci.com

Work beginning at 04.00 p.m. (14.02.08) – Work end 01.00 a.m. (15.2.08)

Main instrumentation used

- main reflecting telescope Ritchey-Chretien 500mm , f/8;
- 180mm f/9 apochromatic refractor placed in parallel with the main telescope;
- Main CCD Finger Lakes FLI IMG digital sensor Kodak KAF 1001E class 1, 1024 x 1024 pixels – placed at the RC 500 primary focus of;
- autoguider CCD Starlight SXVF-H5 placed at the refractor primary focus;
- Software: Maxim DL, The Sky, Robofocus and TRel (by Fabiano Barabucci)

WEATHER CONDITIONS

Seeing:	good seeing with clear sky – irrelevant Moon presence
Wind:	no wind
Temperature:	from +7° (at 4.00 p.m.) to -3° (at 12.00 p.m.)
Remarks:	Minimal star twinkling

MAKE REFERENCE TO THE FOLLOWING HANDBOOKS:

- *Manuale di utilizzo del software di acquisizione TRel – Procedure per le riprese digitali del transito di un pianeta extrasolare* (by Angelo Angeletti, Fabiano Barabucci and Rodolfo Calanca);
- *Operating handbook for shooting extrasolar planet transit* (by Alberto Villa)

1) SHOOTING TRANSIT PROCEDURE

We open the dome doors at 4.00 p.m. (about 6 hours before event beginning) in order to acclimatize as more as possible instrumentations and operating room.

We follow the procedure shown in the *“Operating handbook for shooting extrasolar planet transit”*, already successfully used to shoot the same event on 21st Dec. 2007 and 24th Jan. 2008..

When FLI CCD is gradually cooled at the temperature of -30,3°, we take the following integrations saved in the proper directories:

- No. 50 Flat Fields (3” exposure);
- No. 15 Bias;
- No. 15 Dark Frames (3” exposure).

Then images are processed getting Master Bias – Master Dark Flat e Masterflat.

In order to calibrate transit “light” images, we use a Master Dark already obtained with same parameters during a previous working session.

Before starting transit shooting, we prepare “Set calibration” mask in Maxim DL, since software TRel absolutely need it to calibrate in real time transit images as they are taken.

We frame the field of XO-2b (target) and focus through software Robofocus: best FWHM value = 3,08 at binning 1x1. We put in action the CCD autoguider (adjustments every 3”).

Using TRel, we shoot a test integration (60" exposure time as required for the transit images) verifying the following values both for the target star and per the “twin” reference star (only 30" far).

	TARGET	REF. STAR
Max Pixel	46.208	46.238
S/N	2.183	2.315
Intensity	870.150	893.033

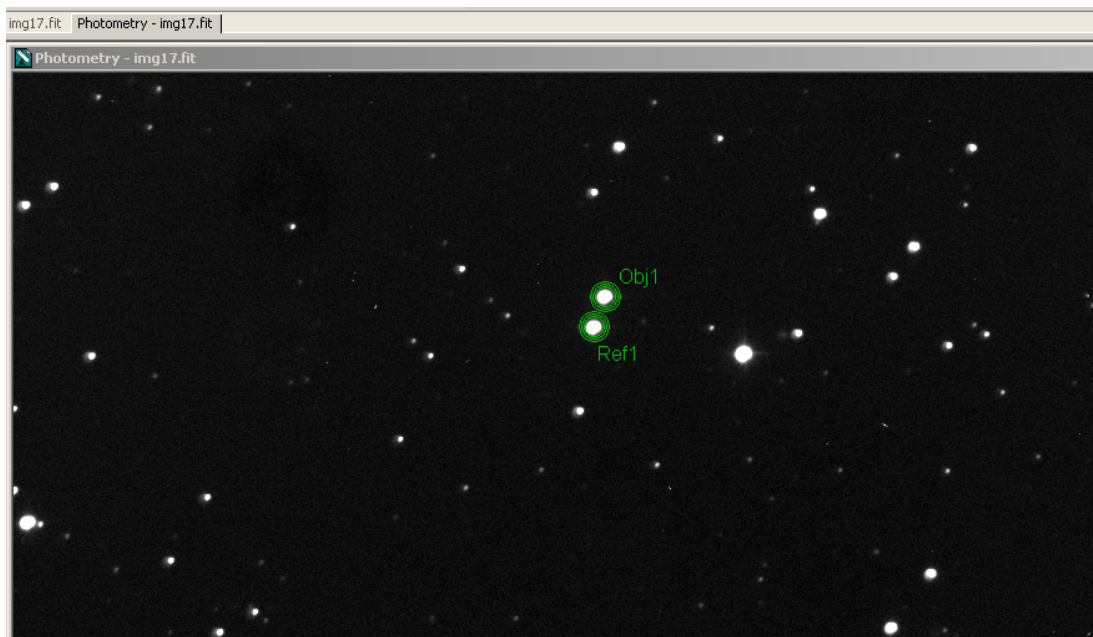


Fig. 1 – The CCD framing: XO-2b = Obj1 / Reference star = Ref1

We prepare the shooting transit sequence in software TRel as follows: no. 160 images (60" exposure each), spaced out 20" plus 15" to download the integration, for a total time of about 4 hours.

After setting up configuration in TRel main mask, we take the reference image where we indicate the “twin” star as “reference star” and XO-2b as “target star” (to be measured). Photometric “rings” value established as follows: aperture radius = 8, gap width = 2, annulus thickness = 2 (see fig. 1).

At 18:21:03 T.U. the Mayor of Peccioli Municipality, Mr. Silvano Crecchi starts the shooting sequence handled by TRel.

We worked very well by using TRel (Maxim e TRel light curves exactly alike) till to 19:40 TU. Then we had some problem: probably, since TRel does not align images before processing them to create the light curve (in Maxim DL we can do this using the function “Auto Star Matching) TRel measurements were influenced by material bending stress that happens when the telescope moves from East to South (local meridian), modifying instrumentations’ weight balance (we can think – for example – to the refractor supports). We think so because autoguider tracking worked very well during all the transit, as confirmed looking to the light

curve processed through Maxim DL. In the following image, we can see the transit light curve screen obtained using TRel till to 19:40, when software was correctly performing

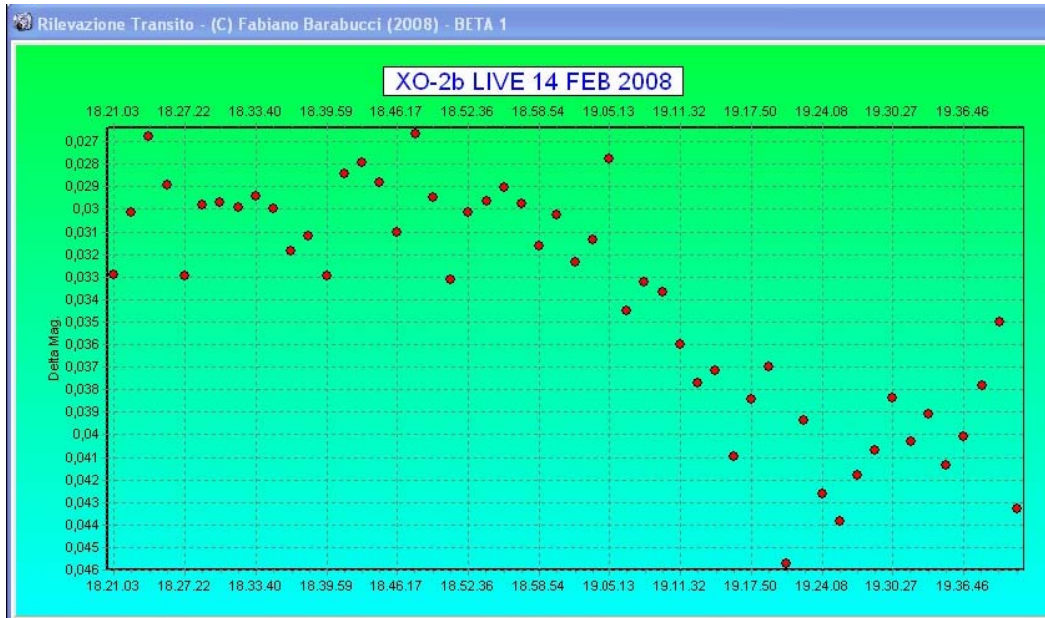


Fig. 2 - We can clearly observe the expected magnitude reduction during the event.

From now on, we aligned and processed the transit images (obtained through TRel) using Maxim DL, obtaining the following XO-2b light curve.

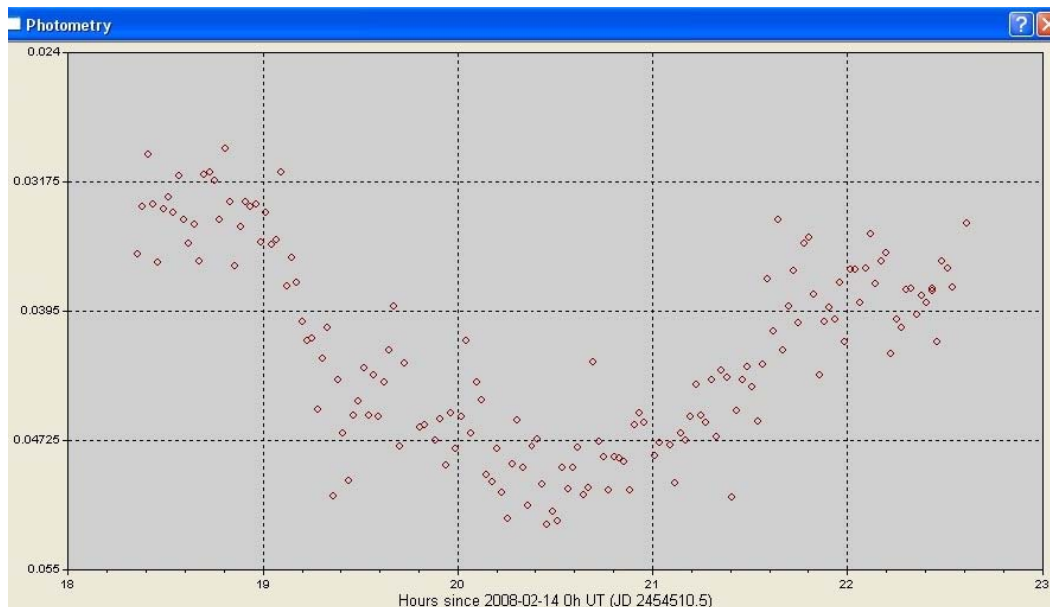


Fig. 3 – XO-2b transit on 24.1.2008: the entire light curve.

2) WEB ON LINE TRANSMISSION

The transmission has been prepared to follow on-line the light curve growing up, also showing slides with commentary about:

- introducing AAVV, Peccioli Municipality and Extra Solar Live! Project.
- extra solar planets: story, research and discovery;
- characteristic of extra solar planet XO-2b;
- procedures used at Centro Astronomico di Libbiano to shot an extra solar planet transit..

The transmission was well handled by AAVV: the light curve growing up was visible on line till to the end of the event.

Unfortunately about at 8.30 p.m. the web service connection was interrupted, being restored about at 10.00 p.m. This fact is not responsibility of AAVV but was probably caused by a great users number, causing the transmission interruption.

The transit light curve was always broadcasted on-line.

We are now trying to understand the real cause of this problem, in order to avoid same setback happens on 27th February next.

However we are very satisfied with the course of this event, also because it seems the extra solar planet transit was transmitted live on the web for the first time!

Libbiano, 14th Feb. 2008

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