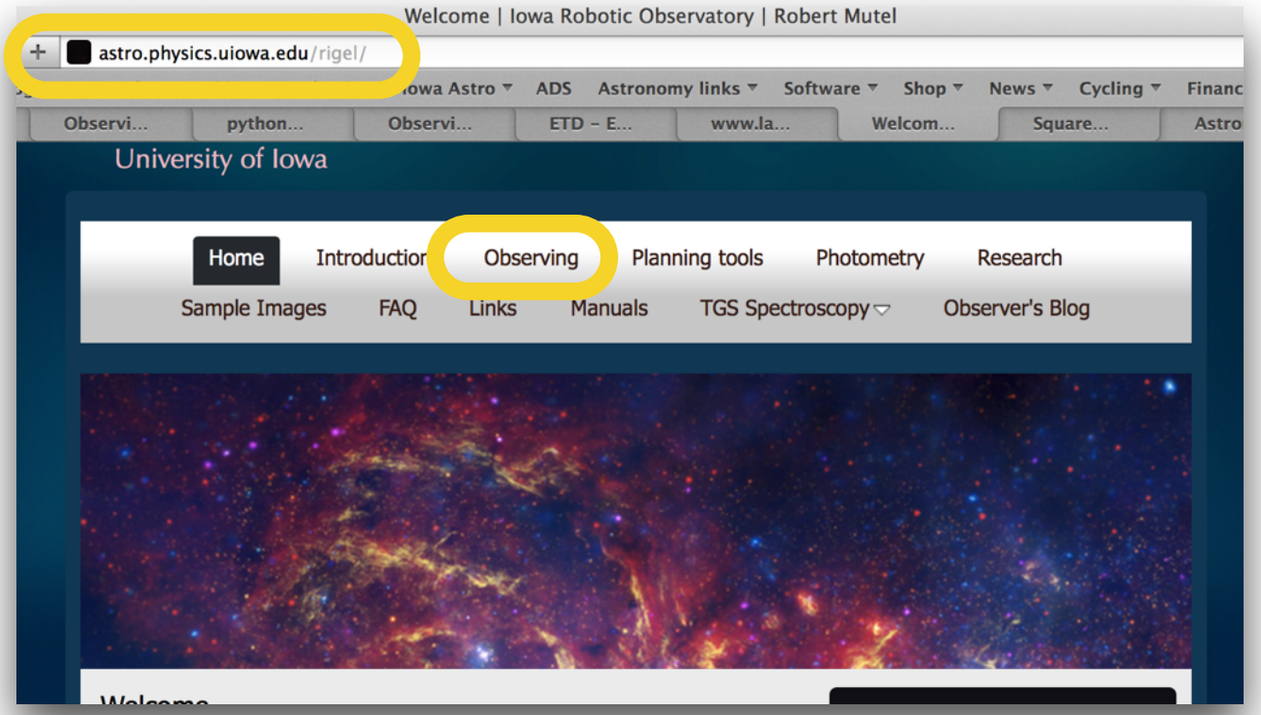
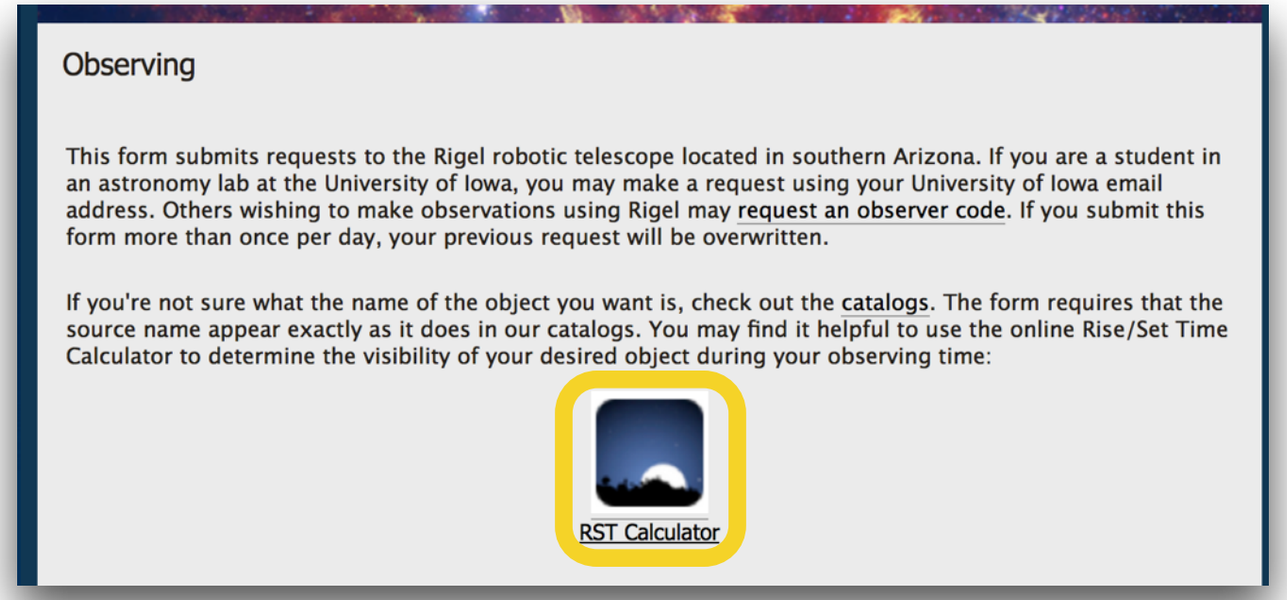
Exoplanet observing in 9 easy steps

Version 1.1 21 Oct 2014 RLM

Observing request planning (Steps 1-5)

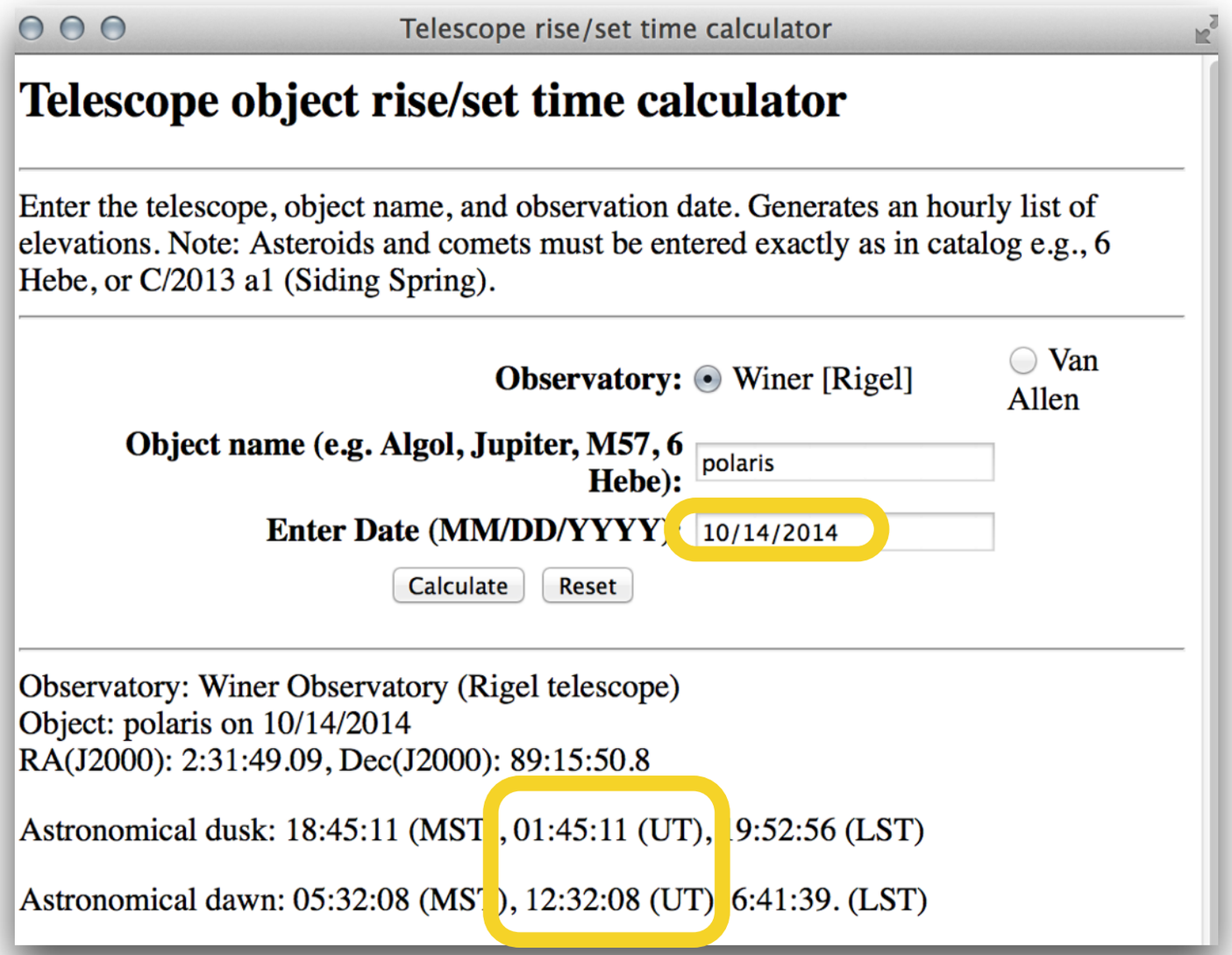
Step 1: Determine the UT rise and set times for the date of observation. To do this, navigate to the Rigel telescope observing page and use the RST tool:





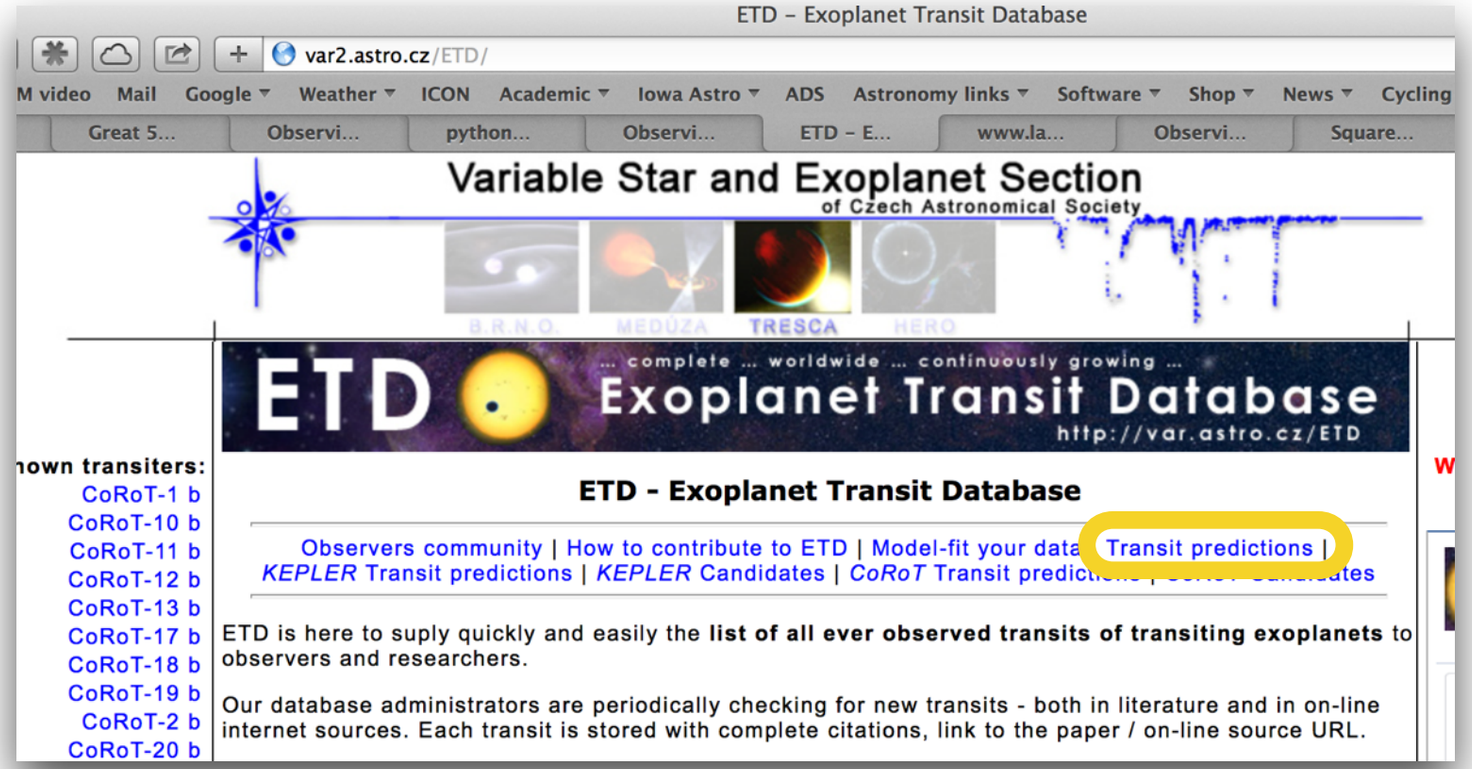
Enter any object name (e.g. Polaris) and optionally a date (defaults to the upcoming night), press Calculate.

Write down the **UT** times of dusk and dawn

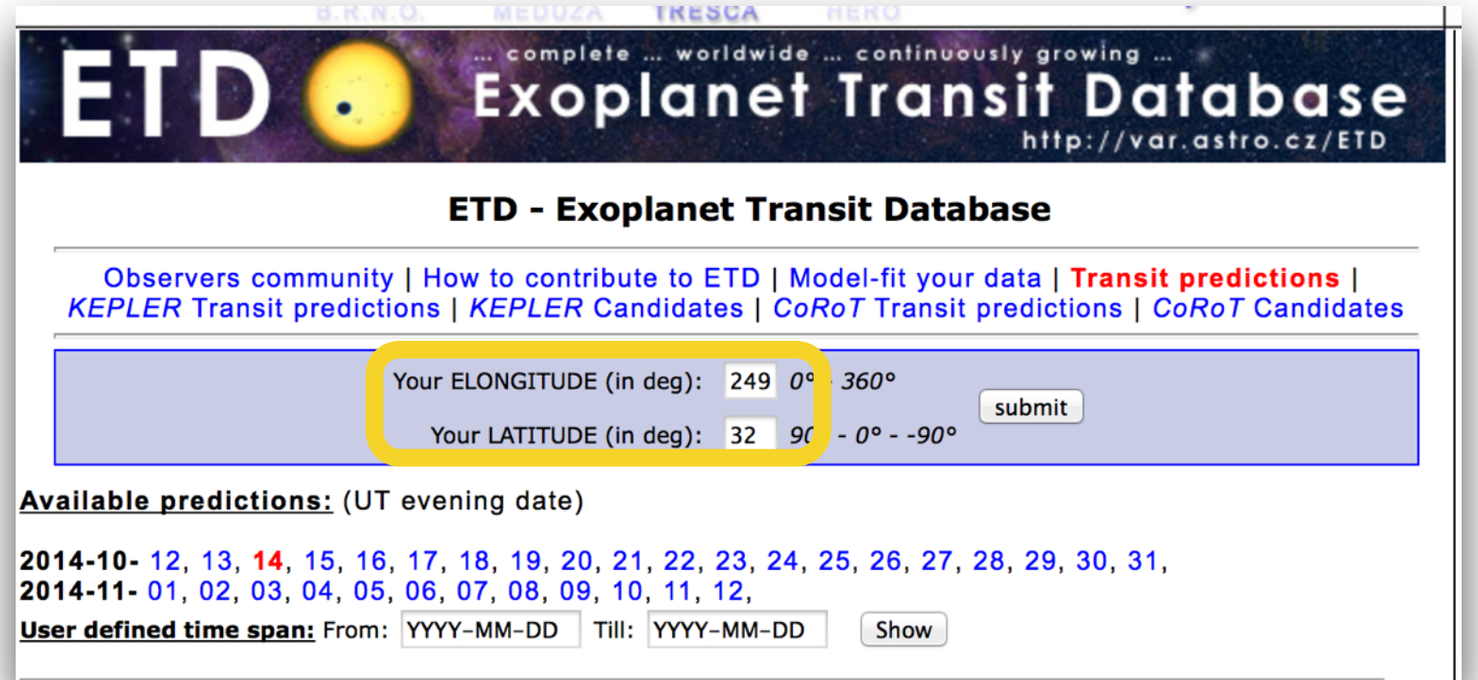


Note: If using Van Allen Observatory, click Van Allen here

Step 2: Navigate to the website
http://var2.astro.cz/ETD
Click on Transit Predictions



Enter coordinates for Winer Observatory (249 E long, 32 N lat)



Note: Van Allen Observatory:
269 E long, 41 N lat

Step 3: Click on desired UT date (defaults to UT date for upcoming evening), choose from list using following criteria:

Criteria:

1. Depth of eclipse should be >0.015,

   preferably >0.02

2. Magnitude V <13.0

3. Start time of eclipse > 1hr after dusk

4. End of eclipse < 1 hr before dawn

5. Elevation >15 deg for entire eclipse

Transits predictions for ELONGITUDE: 249° and LATITUDE: 32°

OBJECT		BEGIN (UT/h,A)	CENTER (DD.MM. UT/h,A)	END (UT/h,A)	D (min)	V (MAG)	DEPTH (MAG)	Elements Coords
CoRoT-1 b	Mon	11:04 49°,SE 56944.9617	**14.10. 12:14** **55°,S** 56945.0100	13:23 54°,S 56945.0582	139	13.6	0.0247	54159.4532+1.508969*E RA: 06 48 19.17 DE: -03 06 07.78
WASP-104 b	Leo	11:40 18°,E 56944.9866	**14.10. 12:33** **30°,E** 56945.0233	13:26 41°,E 56945.0600	105.72	11.12	0.0158	56406.11126+1.7554137*E RA: 10 42 24.61 DE: +07 26 06.3
XO-3 b	Cam	2:00 12°,NE 56945.5836	**15.10. 3:26** **22°,NE** 56945.6437	4:53 33°,NE 56945.7038	173	9.86	0.0048	54864.76684+3.1915289*E RA: 04 21 52.71 DE: +57 49 01.89
WASP-67 b	Sgr	3:19 34°,SW 56945.6388	**15.10. 4:16** **27°,SW** 56945.6783	5:13 18°,SW 56945.7178	113.76	12.5	0.0195	55824.3742+4.61442*E RA: 19 42 58.51 DE: -19 56 58.4
HAT-P-23 b	Del	3:46 65°,SW 56945.6570	**15.10. 4:51** **52°,W** 56945.7024	5:56 38°,W 56945.7478	130.75	12.43	0.0076	54852.26464+1.212884*E RA: 20 24 29.73 DE: +16 45 44.3
WASP-33 b	And	4:24 43°,NE 56945.6835	**15.10. 5:45** **59°,E** 56945.7401	7:07 75°,NE 56945.7967	163	8.3	0.0151	54163.22373+1.2198669*E RA: 02 26 51.08 DE: +37 33 02.5
Kepler-4 b	Dra	3:44 54°,NW 56945.6559	**15.10. 5:51** **34°,NW** 56945.7444	7:59 15°,NW 56945.8330	255	12.6	0.0009	54956.6127+3.21346*E RA: 19 02 27.7 DE: +50 08 8.7
HAT-P-37 b	Dra	4:47 43°,NW 56945.6998	**15.10. 5:57** **32°,NW** 56945.7484	7:07 22°,NW 56945.7969	139.8	13.23	0.0204	55642.14318+2.797436*E RA: 18 57 11.16 DE: +51 16 08.9
WASP-26 b	Cet	4:50 40°,SE 56945.7015	**15.10. 6:00** **44°,S** 56945.7505	7:11 41°,S 56945.7995	141	11.3	0.0108	55123.6379+2.7566*E RA: 00 18 24.7 DE: -15 16 02.3
WASP-6 b	Aqr	5:19 37°,S 56945.7216	**15.10. 6:37** **33°,SW** 56945.7759	7:55 23°,SW 56945.8302	156.4	11.9	0.0236	54596.43267+3.361006*E RA: 23 12 37.75 DE: -22 40 26.1
HAT-P-16 b	And	5:13 72°,NE 56945.7174	**15.10. 6:45** **79°,N** 56945.7813	8:17 66°,NW 56945.8452	184	10.8	0.0101	55027.59293+2.77596*E RA: 00 38 17.59 DE: +42 27 47.2

See next page for magnified view

In this example, there are two exoplanets (green highlight) that satisfy the criteria on previous page.

Dusk -dawn
01:45 UT - 12:32 UT
(from RST, slide 2)

Yellow boxes are for previous night

Red boxes highlight parameters that violate the observing criteria on previous page.

Green boxes are good choices

WASP-6-b has much deeper eclipse (0.0236 vs 0.0151), so we choose it.

Transits predictions for ELONGITUDE: 249° and LATITUDE: 32°

OBJECT		BEGIN (UT/h,A)	CENTER (DD.MM. UT/h,A)	END (UT/h,A)	D (min)	V (MAG)	DEPTH (MAG)	Elements Coords
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Step 4: Calculate the observing parameters:

1. Determine UTSTART time: The eclipse start is 05:19:00, so subtract one hour to establish a good out-of-eclipse baseline: UTSTART = 04:19:00
2. Use R filter (this minimizes the effect of atmospheric extinction on the light curve)
3. Determine exposure time. Use the left table. In our example V=11.9, so t ~ 90s

Exposure time vs apparent magnitude

V mag	Exposure time (sec)
7	2
8	5
9	15
10	30
11	60
12	90

Time between image vs exposure time

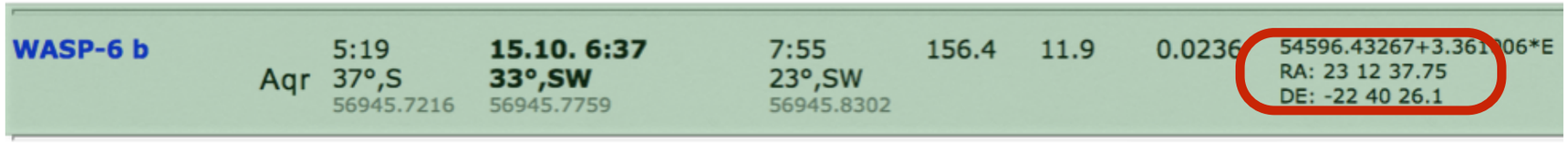
exposure time (sec)	time between images (sec)
0 - 10	20
>10 - 30	40
>30 - 50	60
>50 - 70	80
>70 - 90	100
>90 - 110	120

4. Determine the number of images. To do this, add (at least) one hour end of the eclipse (04:19 UT start, 08:55 UT end). Hence, the total time is 08:55 - 04:19 = 4 h 36min = 16,560 s

5. The exposure time is 90 s per image, so the time between images = 100 s (right table). In our example 90s + 10s = 100s, so the number of images = 16560/100 = 166.

5. Copy the coordinates from the table. In our example RA = 23:12:38 Dec = -22:40:26

6. Enter the UTStart time, number of images, and coordinates on the scheduling webpage.



Step 5: Enter observing parameters on the Rigel web observing request form

Project Information:

Project Title: Demo of exoplanet schedule *

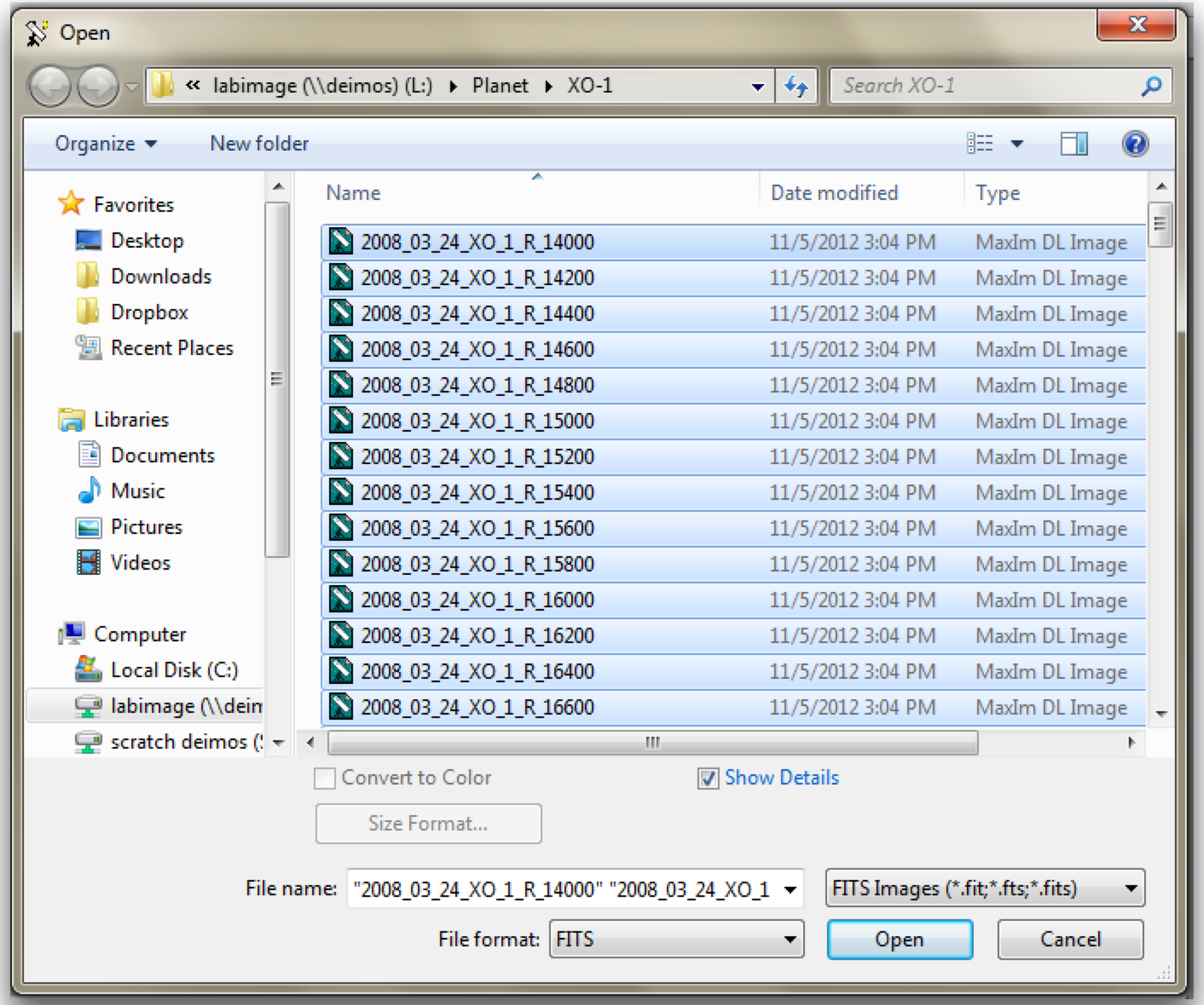
	Target	Filter/Exposure	Advanced Options ☑
☐	Object: WASP 6b ☐ Use Catalog Position RA: 23:12:38 Dec: -22:40:26	Filter: R (red) Exposure: 90	Repeats: 166 Delay: Start Time: 04:19:00 UT UTDate (MM/DD/YYYY): /19/2014
☐	Object: ☑ Use Catalog Position	Filter: N (no filter) Exposure: 60	Repeats: 0 Delay: Start Time: LST UTDate (MM/DD/YYYY):
☐	Object: ☑ Use Catalog Position	Filter: N (no filter) Exposure: 60	Repeats: 0 Delay: Start Time: LST UTDate (MM/DD/YYYY):

Add Row Delete Checked Row(s)

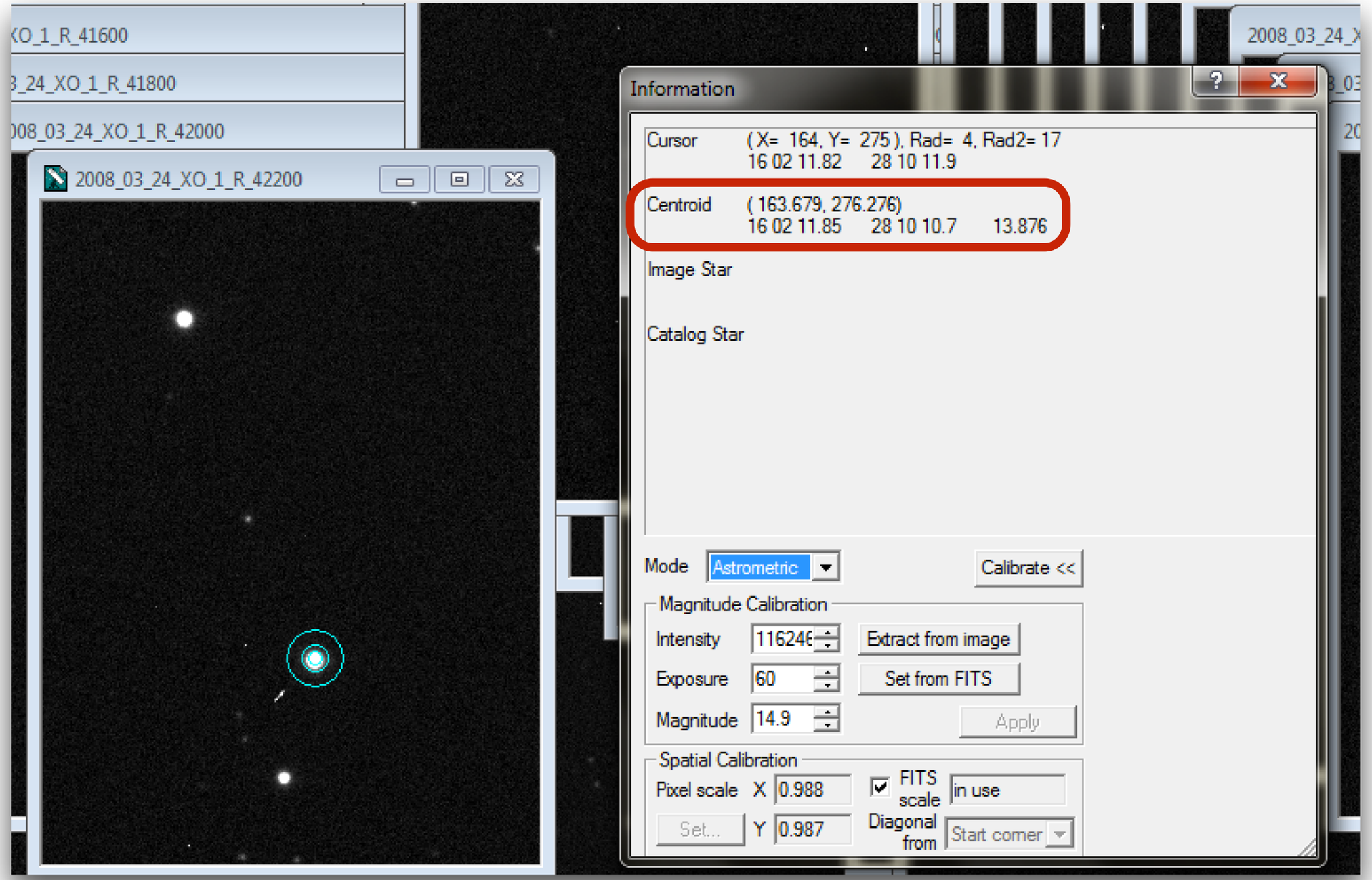
Submit

Image analysis
(Steps 6-9)

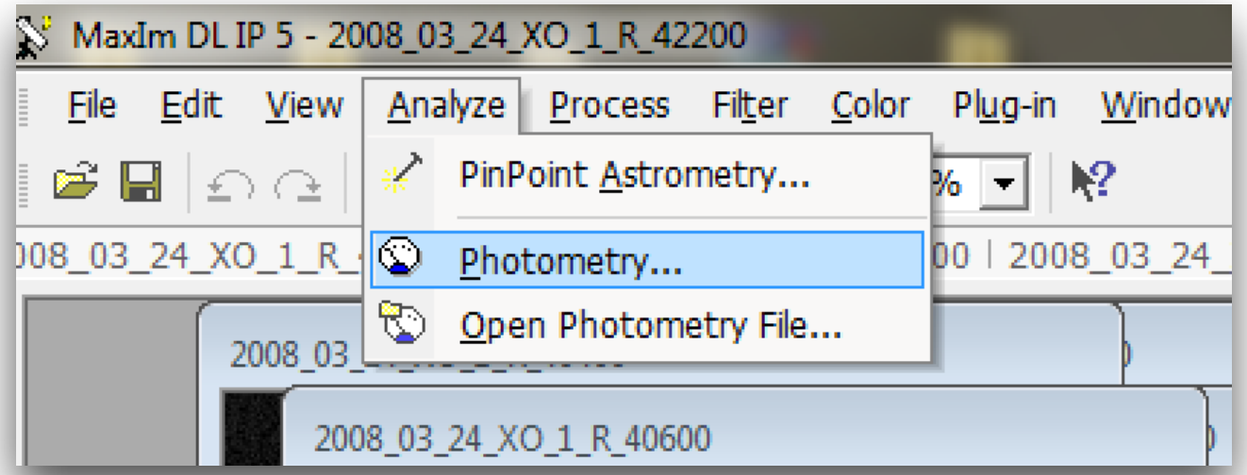
Step 6: After observing, load images (use Control-A to select all)

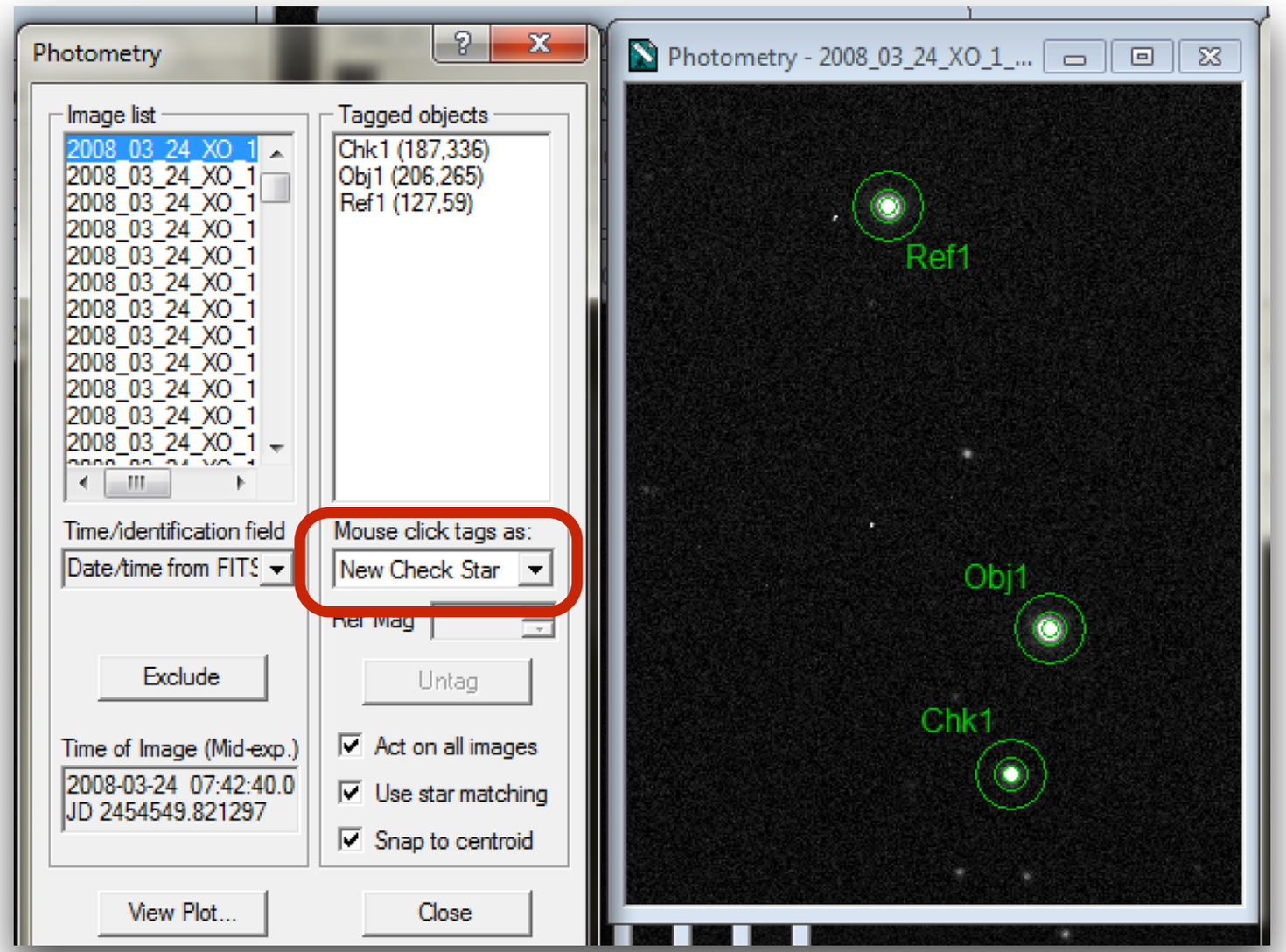


Step 7: Identify the exoplanet star on any image using the Astrometric tool on the Information window (in this example, the exoplanet is XO-1 with coordinates 16:02:11.85, +28:10:10.7)



Step 8: Use photometry tool, select Target, reference, check star





Adjust scale to see target