



# Osservatorio di Libbiano Peccioli (PI)

## plate solving AstroArt5

**7 DICEMBRE 2014**  
**CONVEGNO C.A.A.T.**

relatore: **Mauro Bachini**  
Associazione Astronomica  
Isaac Newton  
Santa Maria a Monte (PI)



## **Problema pratico : QUALE SOFTWARE PER CALCOLARE LA PLATE SOLVING DI UNA IMMAGINE ASTRONOMICA**

SPESSO LA PROCEDURA E' IMPLICITA  
ALL'INTERNO DI SOFTWARE DI USO COMUNE

### **QUALI I SOFTWARE PER ASTROMETRIA**

Ad esempio per i calcoli delle posizioni asteroidali e  
Cometarie per l'invio dei dati al ***MINOR PLANET CENTER***

# MINOR PLANET CENTER PROCEDURE PER L'OSSERVAZIONE DI CORPI MINORI E COMETE

## 1 . QUALI ATTREZZATURE E STRUMENTI ?

Idoneo ogni tipo di telescopio , possibilmente con F luminoso .  
È necessario comunque conoscere la lunghezza focale del telescopio e la dimensione fisica del Pixel del CCD per calcolare la scala "arco/pixel .

La configurazione deve essere tale che la scala dei pixel deve essere di circa di 2 " / pixel ( preferibilmente ) o al massimo 3 " / pixel ( peggiore) .

In pratica , la scala ottimale di pixel si dovrà determinare anche in considerazione alle caratteristiche del seeing del sito

Sottocampionamento e sovracampionamento

## Calcolo scala immagine

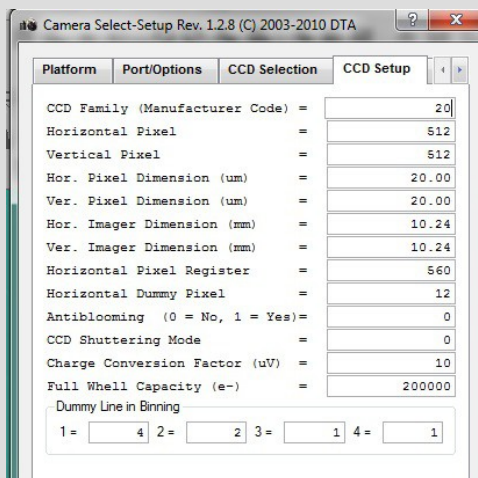
consideriamo ad esempio il riflettore da 400 mm F5 dell'Osservatorio di Tavolaia di Santa Maria a Monte

$f = 2000 \text{ mm}$

Sensore CCD Kodak 260 512x512 pixel  
dimensioni pixel 20 x 20 microm

$\text{"/pix} = 206265/2000 \times 0,020 = 2\text{".06}$  binning 1x1

campo inquadrato  $512 \times 0,02 = 1054.72 \text{ ''}$   
corrispondenti a  $1054,72/60 = 17,57'$



## Calcolo scala immagine

consideriamo sempre il riflettore da 400 mm F5 dell'Osservatorio di Tavolaia di Santa Maria a Monte

$f = 2000$  mm

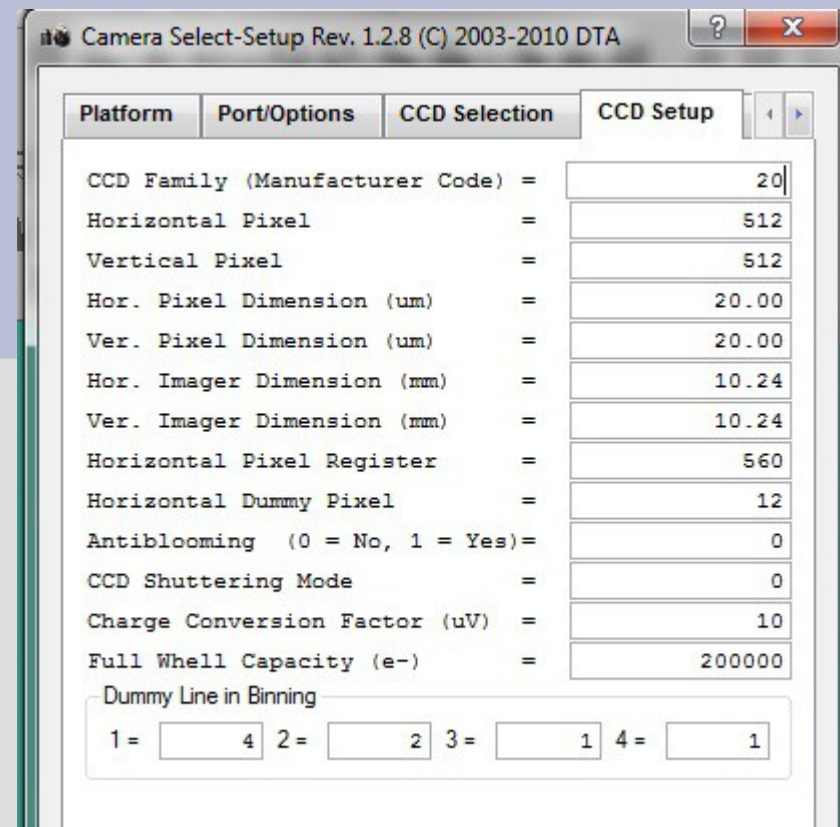
Sensore CCD Kodak 260 512x512 pixel

dimensioni pixel 20 x 20 microm  
uso con binning 2 256x256 pix

$\text{"/pix} = 206265/2000 \times 0,040 = 4\text{''}.12$   
binning 2x2

campo inquadrato  $256 \times 0,04 = 1054.72$  "  
corrispondenti a  $1054,72/60 = 17,57'$

sicuramente in sottocampionamento



Ron Wodaski's CCD Calculator - DTA KAF 260

File Settings View Help

## New Astronomy Press CCD Calculator

**Telescope** **tavolaia Newton 400**

Aperture

Focal ratio **f/**

Barlow or reducer

Focal length

Aperture adjust  Ratio adjust

**Camera** **DTA KAF 260**

Pixel size  ×

Array size  ×


Bin mode

Chip size **10,2mm x 10,2mm**

Image scale **2,06 arcsec/pix**

Field of view **17,6 x 17,6 arcmin**

Exp. Target  CFZ (microns)



10,2mm x 10,2mm

Chip compared to 35mm film

Last ten telescopes and cameras v. 1.5.0

**tavolaia Newton 400**

**DTA KAF 260**

un utile software free e' New Astronomy Press con il quale e' possibile calcolare la scala secondo d'arco /pixel per varie combinazioni di ottica CCD e binning

FOV



## New Astronomy Press

CCD Calculator



**Version 1.5.0**

Copyright © 2002 Ron Wodaski  
Multimedia Madness, Inc.

All rights reserved. Free use for purchasers of "The New CCD Astronomy" book.



Ron Wodaski's CCD Calculator - DTA KAF 260

File Settings View Help

## New Astronomy Press CCD Calculator

Telescope: **tavolaia Newton 400**

Aperture:  Add

Focal ratio: f/  Remove

Barlow or reducer:

Focal length:  Recalc

Aperture adjust  Ratio adjust

Camera: **DTA KAF 260**

Pixel size:  ×

Array size:  ×

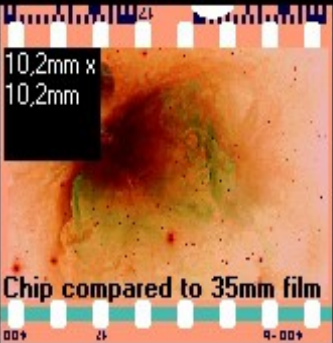
Bin mode:  Add

Chip size: **10,2mm x 10,2mm**

Image scale: **4,12 arcsec/pix** Save

Field of view: **17,6 x 17,6 arcmin**

Exp. Target:  CFZ (microns):



Chip compared to 35mm film

Last ten telescopes and cameras v. 1.5.0

**tavolaia Newton 400** < > Clear

**DTA KAF 260** < > Clear

FOV



10 arcmin - FOV: 17,6min x 17,6min

La soluzione astrometrica e' implicitamente calcolata nei  
SOFTWARE CONSIGLIATI DAL  
MPC

Herbert Raab's *Astrometrica*  
John Rogers' *CCD Astrometry*  
Project Pluto's Charon  
Bob Denny's PinPoint  
BdW Publishing's Canopus  
Prism  
Software Bisque's TheSky + CCDSoft  
Circe  
**fitsblink**

**inoltre Astroart5**



## MINOR PLANET CENTER come si effettuano le misure

I dettagli esatti di come vengono effettuate le misurazioni sulle immagini ed effettuare le riduzioni dipendono dal pacchetto software che viene utilizzato .

In termini generali , si determineranno i pixel  $x$  ,  $y$  per i centroidi di un certo numero di stelle di confronto di posizione nota ( almeno tre stelle di confronto , (preferibilmente tanti quanti centroidi sono sull'immagine ) e i corpi minori in ciascuna immagine .

Utilizzando questi valori  $x$  ,  $y$  (determinati per una frazione di pixel) e le coordinate confronto stella ( presi da un catalogo di riferimento adeguato il programma dovrebbe poi fare una serie di conteggi per determinare le coordinate delle stelle, l'errore rispetto ai cataloghi e poi ovviamente le coordinate dell'oggetto di rilievo considerando il fattore di scala.

## MINOR PLANET CENTER cataloghi di riferimento

MPC CONSIGLIA DI UTILIZZARE IL CATALOGO UCAC-4

the *UCAC4* star catalog pubblicato by USNO in 2012. It include 113 milioni stelle di magnitude 16

ad esempio il software “Astrometrica” dell'austriaco Raab effettua un download diretto per la zona di cielo richiesta

# PIANETINO 712 (BOLIVIANA)

MSB Astroart 4.0

File Edit View Image Filters Arithmetic Color Tools Plug-in Window Help

#1 712\_1\_CAL\_D.fts

R = 83 : 63906 B = 1752 V = 1662 : 2195 Lin

Star atlas

GSC USNOB

C8307

00712

M0314

K138540

12052

RA DEC = 00 39 03.930 +08 06 29.53 Field = 0.35° Angle = 10°

Point: X = 386 Y = 213 Dim.X = 512 Dim.Y = 512 RAM = 1048 Kb

Start astrometria CCD\_TAVOL... Astroart 4.0

02:13

TAVOLAIA OBSERVATORY  
PIANETINO 712 (BOLIVIANA)  
RIPRESE IL 2013 12 15  
RIFLETTORE DA 40 CM F 2000  
CCD DTA DISCOVERI 512 X 512 20 M

MSB Astroart 4.0

File Edit View Image Filters Arithmetic Color Tools Plug-in Window Help

HP LP MK DD CV ME

#1 712\_1\_CAL\_D.fits

Star atlas

GSC USNOB

C8307

73102

00712

M0314

K135540

12052

W8494

Astrometry

#1 712\_1\_CAL\_D.fits

Total stars: 21

Reference stars: 11

O-C Max: 0.75

Center plate: 0.5 X 0.5 Y

Polynomial

OK

0.169554148298

0.142693768911

X, Y ↔ RA, DEC

256 9.714737

256 8.17575

OK Cancel Help

Stars #1 712\_1\_CAL\_D.fits

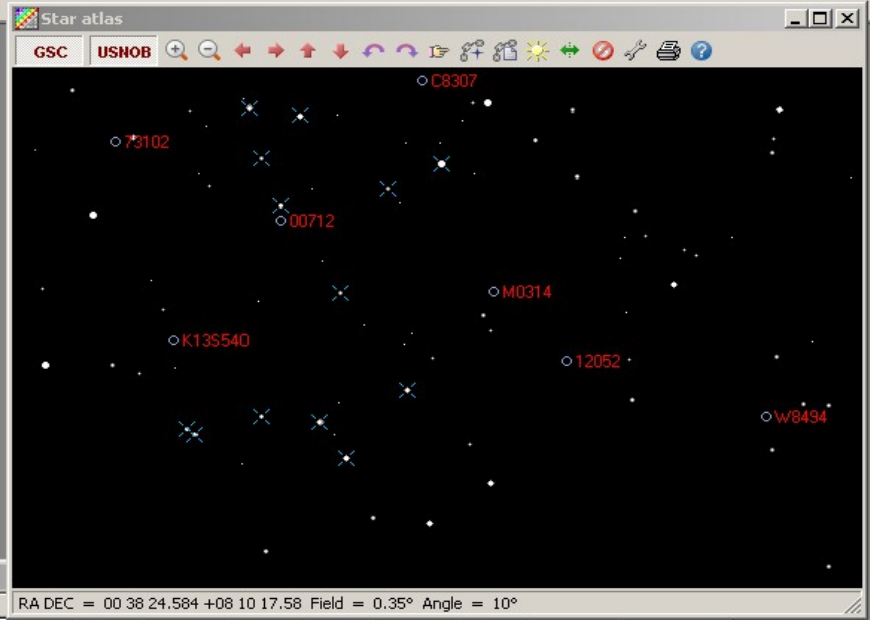
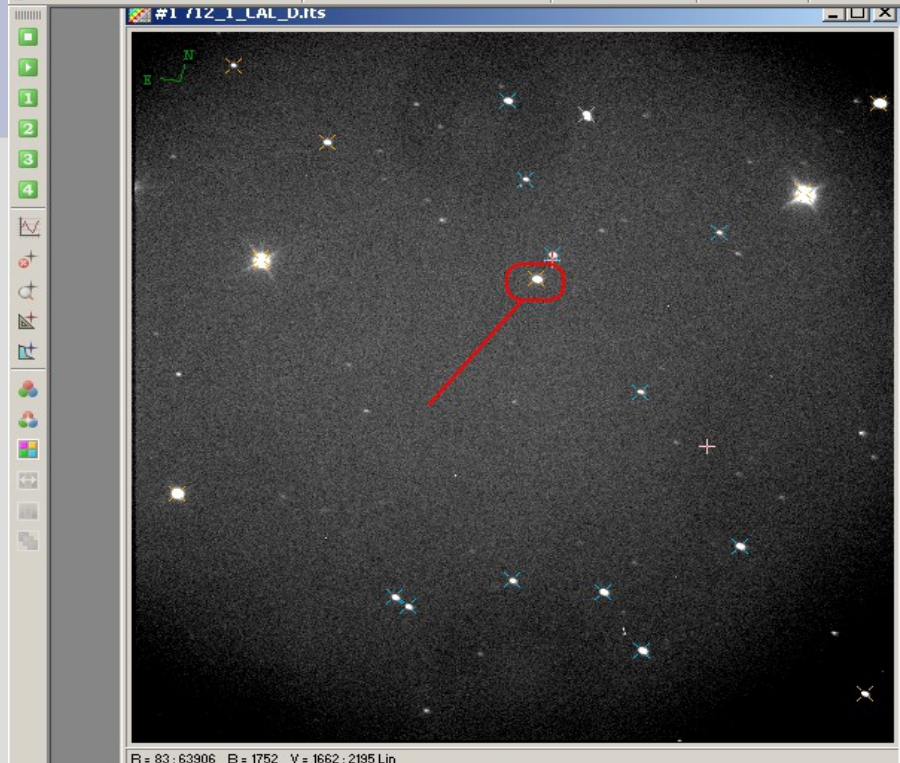
N#	Xc	Yc	ADU	A	P	R.A.*	DEC.*	R.A.	DEC	RA DEC = 00 39 20.324 +08
1	452.05	393.61	904364		REF	9.619130	8.276263	00 38 28.591	+08 16 34.55	7.830
2	450.75	396.66	800611			9.620228	8.277836	00 38 28.855	+08 16 40.21	
3	86.78	346.57	770224			9.821863	8.207180	00 39 17.247	+08 12 25.85	
4	86.24	347.95	515806			9.822333	8.207898	00 39 17.360	+08 12 28.43	
5	30.26	179.20	350481			9.834375	8.106093	00 39 20.250	+08 06 21.93	
6	501.29	460.03	177821			9.598849	8.319492	00 38 23.724	+08 19 10.17	
7	342.43	66.16	27654	REF	REF	9.643239	8.078675	00 38 34.377	+08 04 43.23	12.860 0.37
8	252.30	461.91	26974	REF	REF	9.741037	8.291748	00 38 57.849	+08 17 30.29	13.070 0.59
9	316.45	108.24	24802	REF	REF	9.662850	8.099381	00 38 39.084	+08 05 57.77	13.110 0.25
10	408.04	141.22	22199	REF	REF	9.614553	8.128639	00 38 27.493	+08 07 43.10	13.180 0.11
11	131.03	431.98	21771			9.806692	8.260562	00 39 13.606	+08 15 38.02	
12	305.13	451.92	18888		REF	9.709764	8.292099	00 38 50.343	+08 17 31.56	12.390
13	491.96	34.99	17589			9.554274	8.078389	00 38 13.026	+08 04 42.20	3.19 2.49 147.73 2.5-1-10
14	282.28	350.97	15069	REF	REF	9.710867	8.232364	00 38 50.608	+08 13 56.51	13.650 0.32 2.85 1.74 122.21 2.5-1-10
15	176.47	104.56	14948	REF	REF	9.742248	8.080953	00 38 58.140	+08 04 51.43	13.650 0.11 2.66 2.09 122.61 2.5-1-10
16	185.51	97.75	11177	REF	REF	9.736350	8.078195	00 38 56.724	+08 04 41.50	14.000 0.15 2.72 1.90 95.22 2.5-1-10
17	255.34	116.48	9937	REF	REF	9.698673	8.096867	00 38 47.682	+08 05 48.72	14.190 0.17 2.73 2.20 85.67 2.5-1-10
18	68.04	487.39	7008			9.849135	8.284506	00 39 23.792	+08 17 04.22	2.45 2.11 63.02 2.5-1-10
19	264.27	405.31	5600	REF	REF	9.727659	8.260948	00 38 54.638	+08 15 39.41	14.850 0.39 2.79 2.04 50.39 2.5-1-10
20	341.37	252.32	5467	REF	REF	9.685650	8.183539	00 38 39.756	+08 11 00.74	14.780 0.25 3.28 2.26 49.15 2.5-1-10
21	394.29	367.00	4392	REF	REF	9.648950	8.254495	00 38 35.748	+08 15 16.18	15.010 0.09 2.98 1.84 40.05 2.5-1-10

Perform astrometry with the selected stars

Press F1 for help

Start astrometria Ccd\_TAVOL... Astroart 4.0 ASTROART3.png (85%) ... Risorse del computer

02:25



8	252.30	461.91	26974	REF	REF	9.741037	8.291748	00 38 57.849	+08 17 30.29	13.070	0.59	2.78	1.88	199.56	2.5-1-10
9	316.45	108.24	24802	REF	REF	9.662850	8.099381	00 38 39.084	+08 05 57.77	13.110	0.25	3.24	2.32	186.85	2.5-1-10
10	408.04	141.22	22199	REF	REF	9.614553	8.128639	00 38 27.493	+08 07 43.10	13.180	0.11	3.24	2.38	171.15	2.5-1-10
11	131.03	431.98	21771			9.806692	8.260562	00 39 13.606	+08 15 38.02			2.62	1.75	167.19	2.5-1-10
12	305.13	451.92	18888		REF	9.709764	8.292099	00 38 50.343	+08 17 31.56	12.390		3.06	2.51	148.91	2.5-1-10
13	491.96	34.99	17589			9.554274	8.078389	00 38 13.026	+08 04 42.20			3.19	2.49	147.73	2.5-1-10
14	282.28	350.97	15069	REF	REF	9.710867	8.232364	00 38 50.608	+08 13 56.51	13.650	0.32	2.85	1.74	122.21	2.5-1-10
15	176.47	104.56	14948	REF	REF	9.742248	8.080953	00 38 58.140	+08 04 51.43	13.650	0.11	2.66	2.09	122.61	2.5-1-10
16	185.51	97.75	11177	REF	REF	9.736350	8.078195	00 38 56.724	+08 04 41.50	14.000	0.15	2.72	1.90	95.22	2.5-1-10
17	255.34	116.48	9937	REF	REF	9.698673	8.096867	00 38 47.682	+08 05 48.72	14.190	0.17	2.73	2.20	85.67	2.5-1-10
18	68.04	487.39	7008			9.849135	8.284506	00 39 23.792	+08 17 04.22			2.45	2.11	63.02	2.5-1-10
19	264.27	405.31	5600	REF	REF	9.727659	8.260948	00 38 54.638	+08 15 39.41	14.850	0.39	2.79	2.04	50.39	2.5-1-10
20	341.37	252.32	5467	REF	REF	9.665650	8.183539	00 38 39.756	+08 11 00.74	14.780	0.25	3.28	2.26	49.15	2.5-1-10
21	394.29	367.00	4392	REF	REF	9.648950	8.254495	00 38 35.748	+08 15 16.18	15.010	0.09	2.98	1.84	40.05	2.5-1-10
22	271.51	333.60	53921			9.715018	8.221376	00 38 51.604	+08 13 16.95			2.71	2.07	332.18	2.5-1-10

COORDINATE A.R. E DEC. MISURATE CON SOLUZIONE ASTROMETRICA

MSB Astroart 4.0

File Edit View Image Filters Arithmetic Color Tools Plug-in Window Help

Star atlas

GSC USNOB

08 16 34.55 7.830 0.15 5.24 6.36 1741.84 2.5-1.0

08 16 40.21 8.144 3.10 5.71 1634.59 2.5-1.0

08 12 25.85 8.197 4.14 4.48 1601.60 2.5-1.0

08 12 28.43 8.740 2.09 4.29 1295.30 2.5-1.0

2.63 2.13 1052.29 2.5-1.0

3.05 2.26 720.89 2.5-1.0

0.15 3.21 2.32 204.40 2.5-1.0

0.33 2.78 1.88 199.56 2.5-1.0

0.26 3.24 2.32 186.85 2.5-1.0

0.18 3.24 2.38 171.15 2.5-1.0

2.62 1.75 167.19 2.5-1.0

0.83 3.06 2.51 148.91 2.5-1.0

3.19 2.49 147.73 2.5-1.0

0.12 2.85 1.74 122.21 2.5-1.0

0.11 2.66 2.09 122.61 2.5-1.0

0.07 2.72 1.90 95.22 2.5-1.0

0.10 2.73 2.20 85.67 2.5-1.0

2.45 2.11 63.02 2.5-1.0

0.02 2.79 2.04 50.39 2.5-1.0

0.12 3.28 2.26 49.15 2.5-1.0

0.19 2.98 1.84 40.05 2.5-1.0

2.71 2.07 332.18 2.5-1.0

EC RA DEC = 00 38 24.584 +08 10 17.58 Field = 0.35° Angle = 10°

Photometry

#1 712\_1\_CAL\_D.fits

Total stars : 22  
Reference stars : 13

O-C Max: 1.25

0.83	0.33	0.26
0.19	0.18	0.15
0.15	0.12	0.12
0.11	0.10	0.07
0.02		

Polynomial

Mag = k1 + k2 log (ADU)

k1 = 26.5668764

k2 = -3.12064916

ADU <-> Mag

ADU = 1000

Mag = 11.205

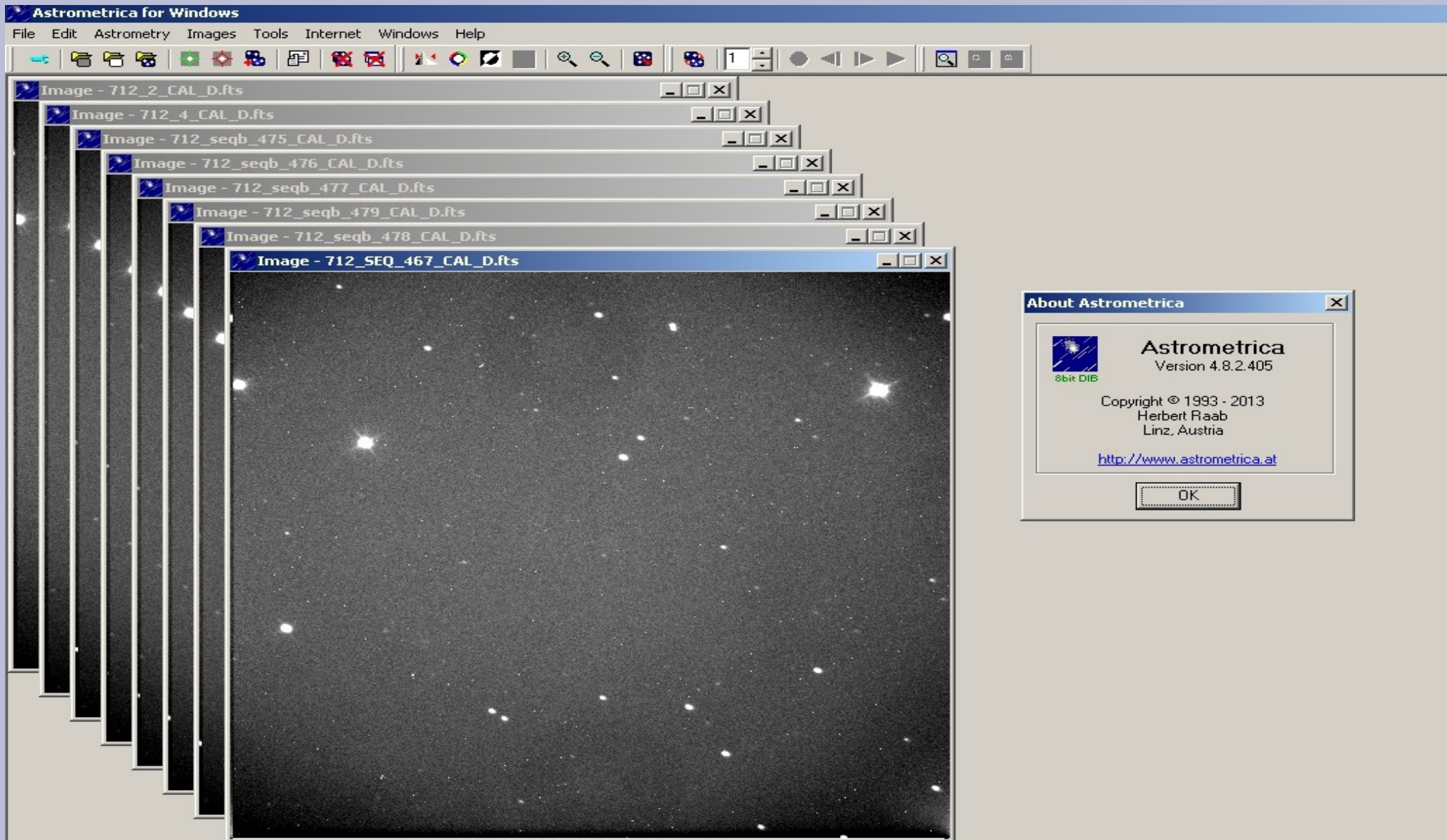
8	252.30	461.91	26974	REF	REF	9.741037															
9	316.45	108.24	24802	REF	REF	9.662850															
10	408.04	141.22	22199	REF	REF	9.614553															
11	131.03	431.98	21771			9.806692															
12	305.13	451.92	18888		REF	9.709764															
13	491.96	34.99	17589			9.554274															
14	282.28	350.97	15069	REF	REF	9.710867															
15	176.47	104.56	14948	REF	REF	9.742248															
16	185.51	97.75	11177	REF	REF	9.736350															
17	255.34	116.48	9937	REF	REF	9.698673															
18	68.04	487.39	7008			9.849135															
19	264.27	405.31	5600	REF	REF	9.727659															
20	341.37	252.32	5467	REF	REF	9.665650															
21	394.29	367.00	4392	REF	REF	9.648950															
22	271.51	333.60	53921			9.715018															
							8.221376		00 38 51.604		+08 13 16.95		11.801								

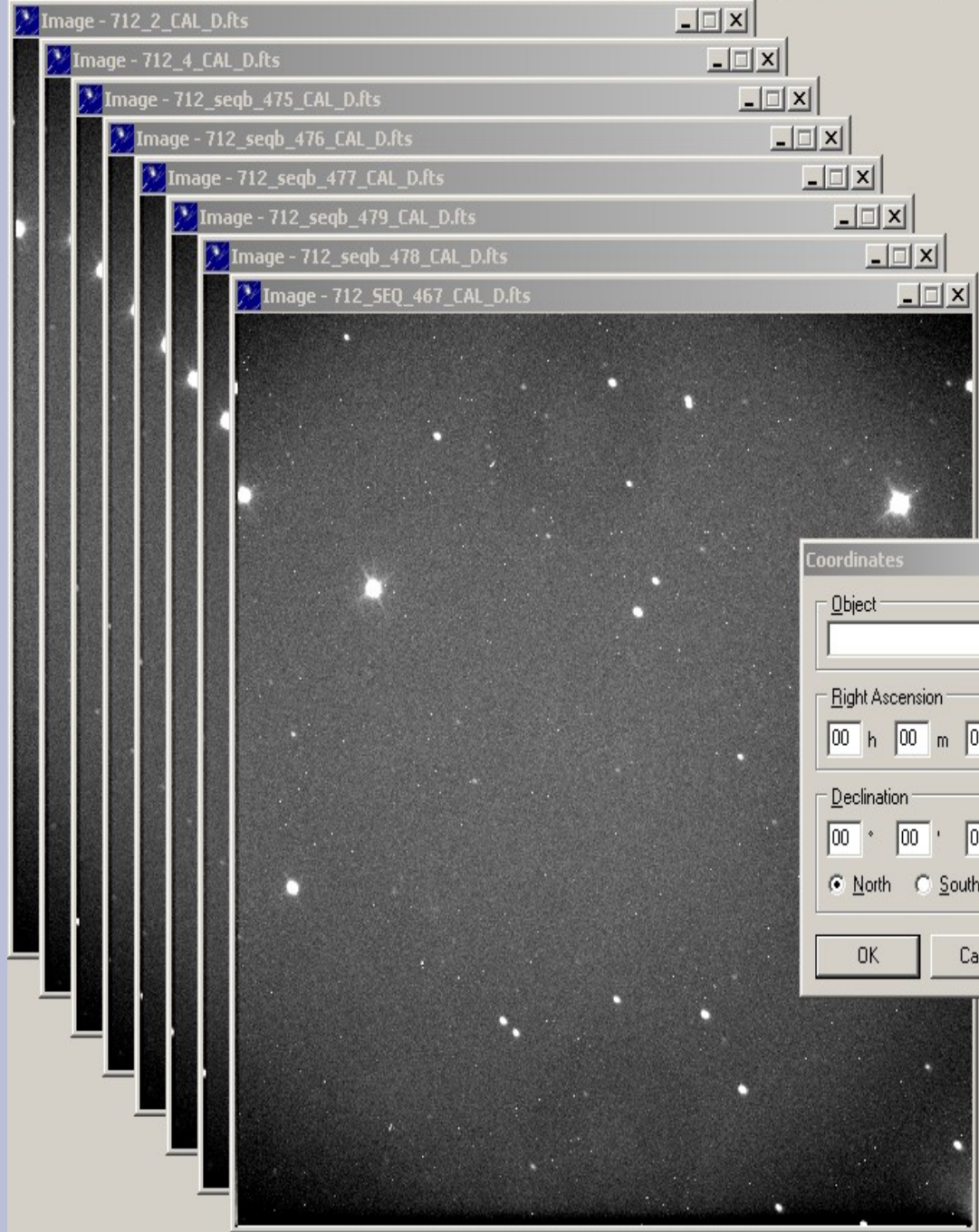
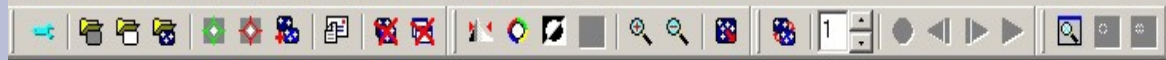
CON TOOL FOTOMETRIA VIENE CALCOLATA LA MV DELL'OGGETTO

Perform photometry with the selected stars

Press F1 for help

# Utilizzo di ASTROMETRICA





**Coordinates** [X]

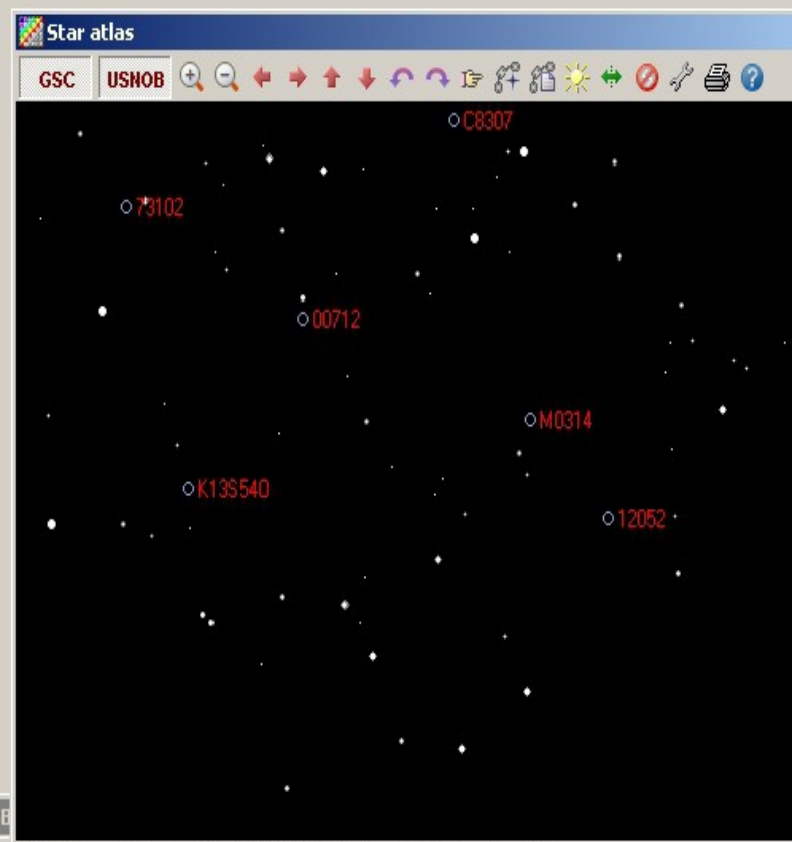
Object

Right Ascension  
 h  m  s

Declination  
 °  '  ''

North  South

OK Cancel



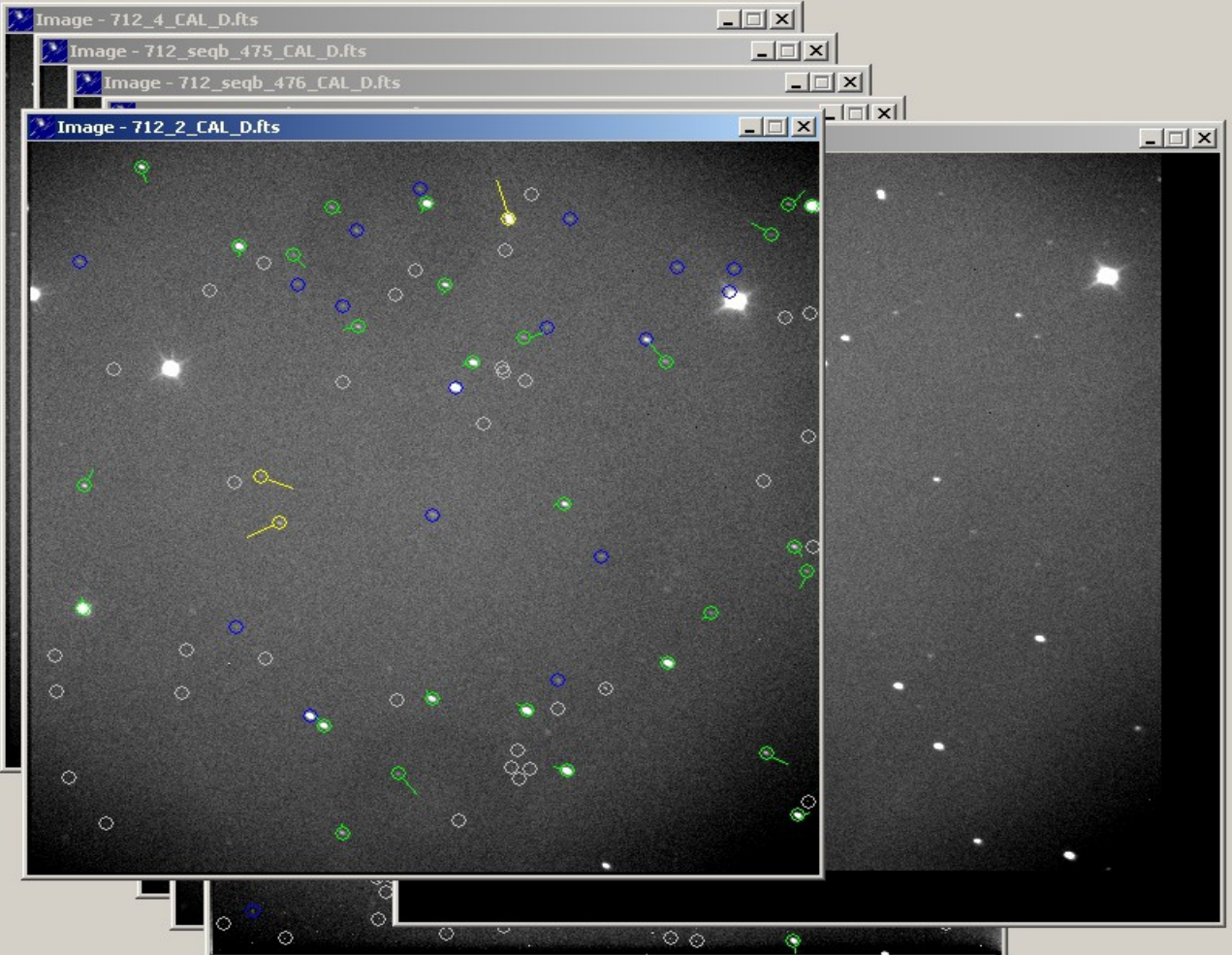
MSE

File RA DEC = 00 38 43.467 +08 10 07.49 Field = 0.35° Angle = 10°

Toolbar with icons for file operations, image processing, and navigation.

HP LP MK DD CV ME

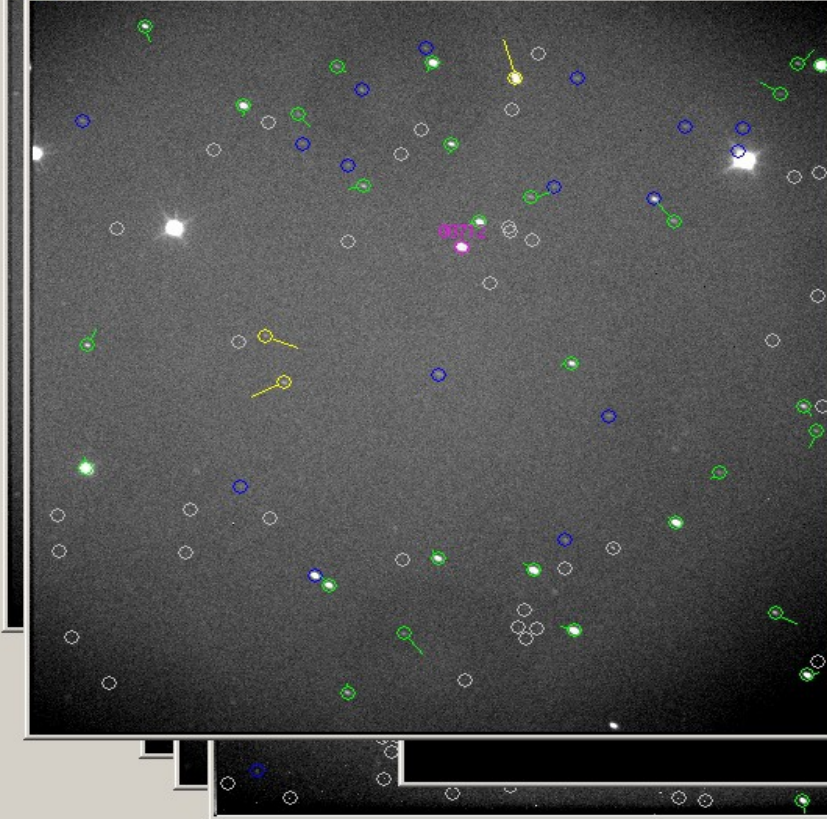




Data Reduction Results

Image	Stars	Ref. Stars	Ref./Ast.	Fit Order	dRA	dDe	Ref./Phot.	dmag	Zero Pt.
712_2_CAL_D.fits	49	31	28	1	0.17"	0.15"	24	0.08mag	24.16mag
712_4_CAL_D.fits	45	24	21	1	0.18"	0.08"	19	0.07mag	24.11mag
712_SEQ_467_CAL_D.fits	50	33	27	1	0.14"	0.11"	26	0.08mag	24.13mag
712_seqb_475_CAL_D.fits	50	27	21	1	0.16"	0.11"	21	0.10mag	24.15mag
712_seqb_476_CAL_D.fits	46	28	25	1	0.18"	0.12"	22	0.09mag	24.12mag

- Image - 712\_4\_CAL\_D.fits
- Image - 712\_seqb\_475\_CAL\_D.fits
- Image - 712\_seqb\_476\_CAL\_D.fits
- Image - 712\_2\_CAL\_D.fits



### Object Verification

Display  
 Zoom **2x** Center **Object** Freq. **1**

Information  
 712\_2\_CAL\_D.fits  
 2013 12 15.86398 (20:44:08 UT)  
 RA = 00 38 51.78 De = +08 13 16.3 R = 12.2

Object Designation

Note

PSF - Fit  
 x = 276.05  
 y = 171.27  
 SNR = 88.7  
 Flux = 62842  
 FWHM = 5.1"  
 Fit RMS = 0.044

#### Data Reduction Results

Image	Stars	Ref. Stars	Ref./Ast.	Fit Order	dRA	dDe	Ref./Phot.	dmag	Zero Pt.
712_2_CAL_D.fits	49	31	28	1	0.17"	0.15"	24	0.08mag	24.16mag
712_4_CAL_D.fits	45	24	21	1	0.18"	0.08"	19	0.07mag	24.11mag
712_SEQ_467_CAL_D.fits	50	33	27	1	0.14"	0.11"	26	0.08mag	24.13mag
712_seqb_475_CAL_D.fits	50	27	21	1	0.16"	0.11"	21	0.10mag	24.15mag
712_seqb_476_CAL_D.fits	46	28	25	1	0.18"	0.12"	22	0.09mag	24.12mag

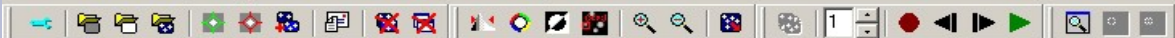
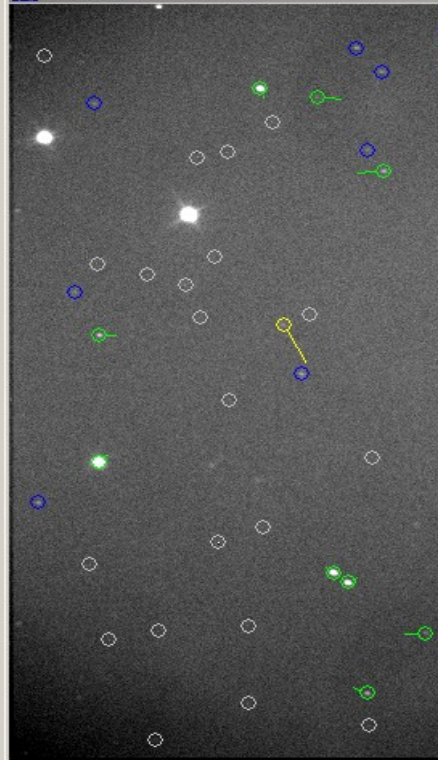


Image - 712\_4\_CAL\_D.fits

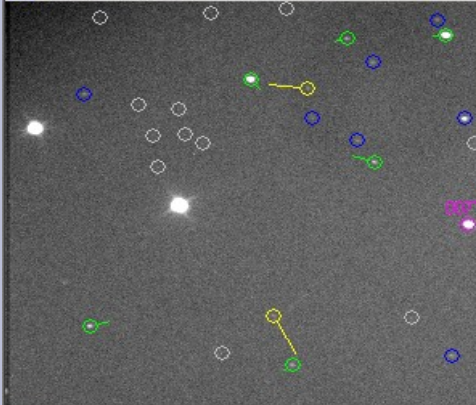


MPCReport.txt

```

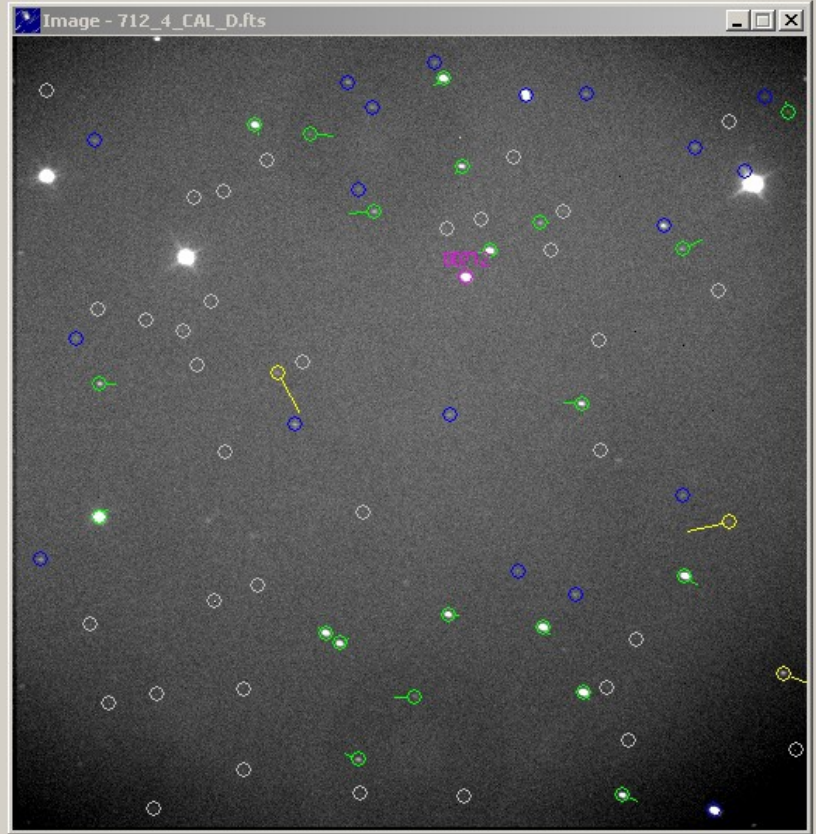
COD A29
CON M. BACHINI [mauro.bachini@libero.it]
OBS M. BACHINI
MEA M. BACHINI
TEL TEL 0.25-m f/10 Schmidt-Cassegrain + CCD + f/6.3 focal reducer
ACK MPCReport file updated 2013.12.19 03:17:12
AC2 mauro.bachini@libero.it
NET UCAC-4
00712      C2013 12 15.86398 00 38 51.78 +08 13 16.3      12.2 R      A29
00712      C2013 12 15.86398 00 38 51.78 +08 13 16.3      12.2 R      A29
00712      C2013 12 15.87269 00 38 52.25 +08 13 15.1      12.1 R      A29
00712      C2013 12 15.87373 00 38 52.33 +08 13 15.1      12.2 R      A29
00712      C2013 12 15.87397 00 38 52.34 +08 13 14.9      12.1 R      A29
00712      C2013 12 15.87421 00 38 52.37 +08 13 15.0      12.1 R      A29
00712      C2013 12 15.87447 00 38 52.38 +08 13 14.8      12.1 R      A29
00712      C2013 12 15.87471 00 38 52.39 +08 13 14.9      12.1 R      A29
----- end -----
    
```

Image - 712\_seqb\_475\_CAL\_D.fits



Data Reduction Results

Image	Stars	Ref. Stars	Ref./Ast.	Fit Order	dRA	dDe	Ref./Phot.	dmag	Zero Pt.
712_2_CAL_D.fits	49	31	28	1	0.17"	0.15"	24	0.08mag	24.16mag
712_4_CAL_D.fits	45	24	21	1	0.18"	0.08"	19	0.07mag	24.11mag
712_SEQ_467_CAL_D.fits	50	33	27	1	0.14"	0.11"	26	0.08mag	24.13mag
712_seqb_475_CAL_D.fits	50	27	21	1	0.16"	0.11"	21	0.10mag	24.15mag
712_seqb_476_CAL_D.fits	46	28	25	1	0.18"	0.12"	22	0.09mag	24.12mag



### Program Settings - Astrometrica\_tavolaia.cfg

Observing Site: **CCD** | Program | Environment | Catalogs | Internet

**Location**

MPC Code:

Longitude:  °  East  West

Latitude:  °  North  South

Height:  m

**Details**

Contact:

E-Mail:

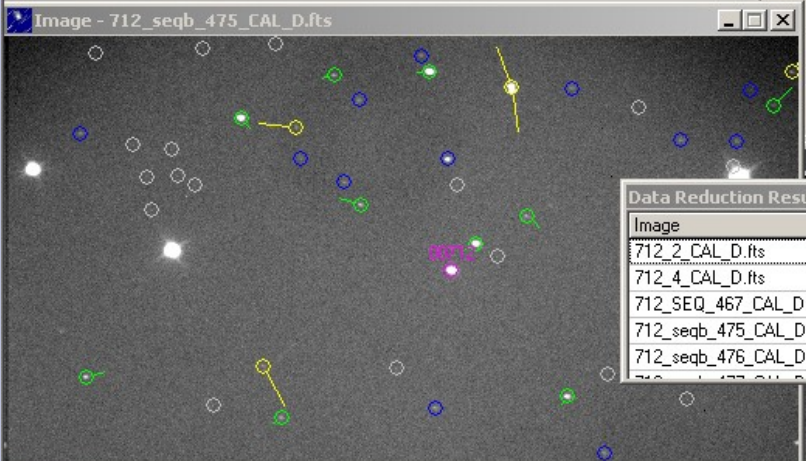
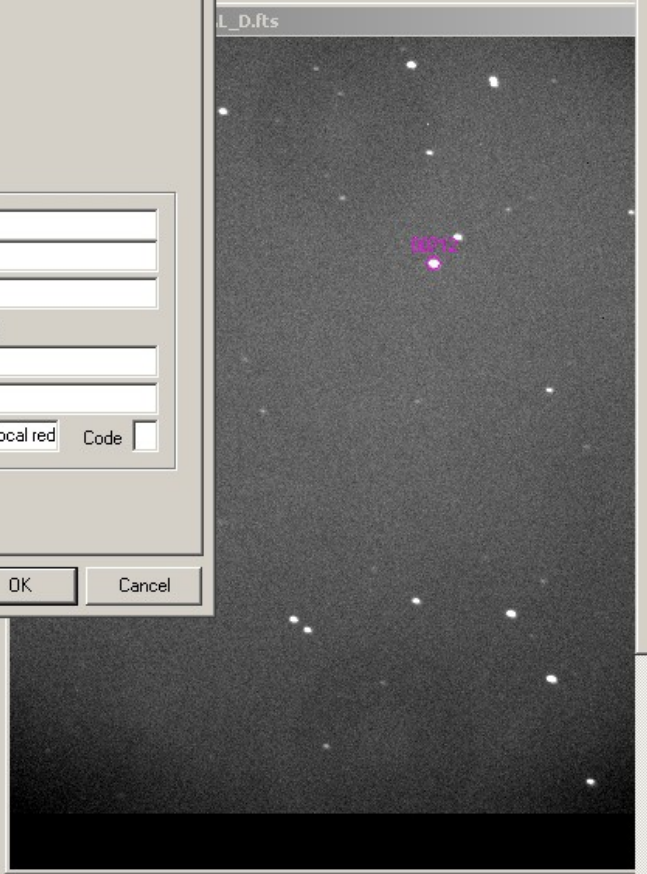
Include Contact Details in MPCReport

Observer:

Measurer:

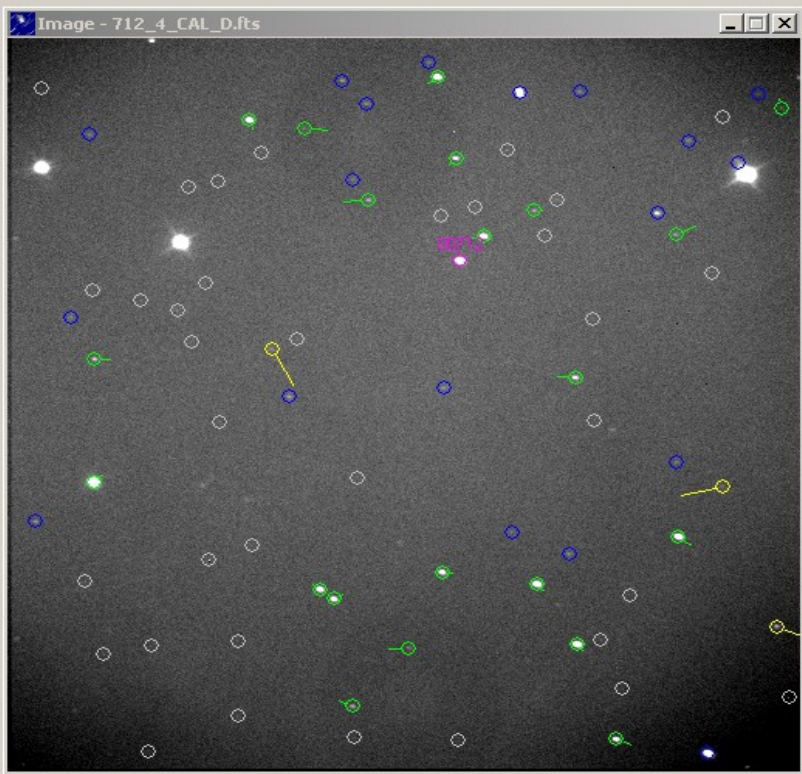
Telescope:  Code:

Open Save Save As OK Cancel



#### Data Reduction Results

Image	Stars	Ref. Stars	Ref./Ast.	Fit Order	dRA	dDe	Ref./Phot.	dmag	Zero Pt.
712_2_CAL_D.fts	49	31	28	1	0.17"	0.15"	24	0.08mag	24.16mag
712_4_CAL_D.fts	45	24	21	1	0.18"	0.08"	19	0.07mag	24.11mag
712_SEQ_467_CAL_D.fts	50	33	27	1	0.14"	0.11"	26	0.08mag	24.13mag
712_seqb_475_CAL_D.fts	50	27	21	1	0.16"	0.11"	21	0.10mag	24.15mag
712_seqb_476_CAL_D.fts	46	28	25	1	0.18"	0.12"	22	0.09mag	24.12mag



**Program Settings - Astrometrica\_tavolaia.cfg**

Observing Site: **CCD** | Program | Environment | Catalogs | Internet

**Scale and Orientation**

Focal Length: 2000.0 mm ± 10.0 %

Position Angle: 10.0 ° ± 30.0 °

Pointing ± 30.0 "

Flip Horizontal  Flip Vertical

Auto-Rotate on PIERSIDE keyword

Auto-Save FITS with WCS

**Time in File Header**

Start of Exposure

Middle of Exposure

End of Exposure

Offset: 0.00 h from UT

Precision: 1.00 Seconds

Skip checking of Time after Loading

**CCD Chip**

Pixel Width: 20.0 μm

Pixel Height: 20.0 μm

Saturation: 60000

**Color Band**

Blue (B)

Visual (V)

Red (R)

Filter: Clear/None

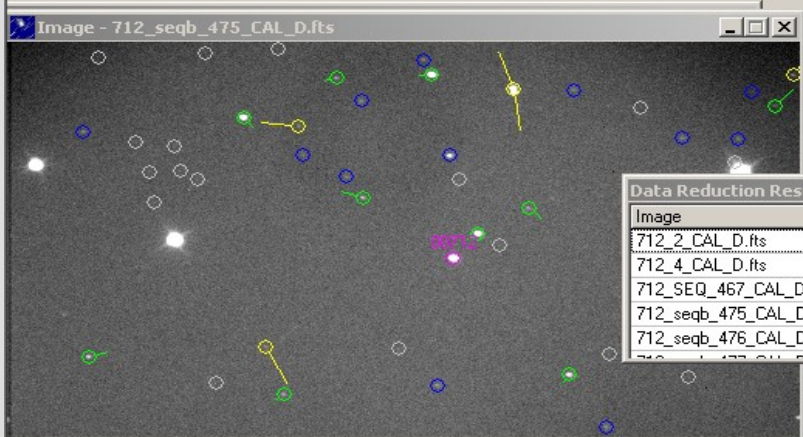
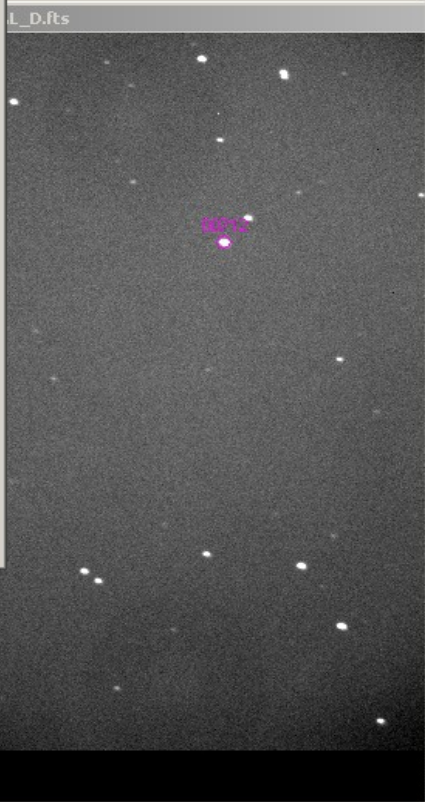
**Exposure from FITS**

Minutes

Seconds

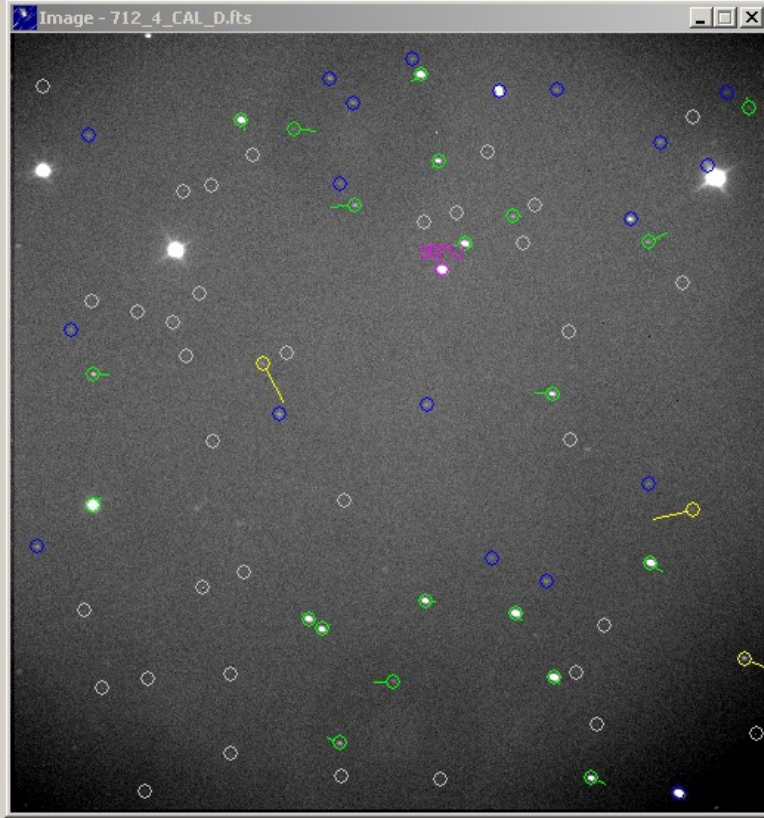
Milliseconds

Open Save Save As OK Cancel



**Data Reduction Results**

Image	Stars	Ref. Stars	Ref./Ast.	Fit Order	dRA	dDe	Ref./Phot.	dmag	Zero Pt.
712_2_CAL_D.fits	49	31	28	1	0.17"	0.15"	24	0.08mag	24.16mag
712_4_CAL_D.fits	45	24	21	1	0.18"	0.08"	19	0.07mag	24.11mag
712_SEQ_467_CAL_D.fits	50	33	27	1	0.14"	0.11"	26	0.08mag	24.13mag
712_seqb_475_CAL_D.fits	50	27	21	1	0.16"	0.11"	21	0.10mag	24.15mag
712_seqb_476_CAL_D.fits	46	28	25	1	0.18"	0.12"	22	0.09mag	24.12mag



**Program Settings - Astrometrica\_tavolaia.cfg**

Observing Site | CCD | **Program** | Environment | Catalogs | Internet

**Object Detection**

Aperture Radius: 4 Pixels  
 Detection Limit: 4.0  $\sigma$   
 Minimum FWHM: 0.70 Pixels  
 PSF-Fit RMS: 0.20  
 Search Radius: 0.75 Pixels  
 Background from:  PSF  Aperture

**Star Catalog**

UCAC 4  
 Upper Limit: 6.0 mag  
 Lower Limit: 18.0 mag

**Reference Star Matching**

Number of Stars: 50  
 Search Radius: 2.00 Pixels

**Plate Constants**

Linear Fit  
 Quadratic Fit  
 Cubic Fit  
 4th-Order Fit

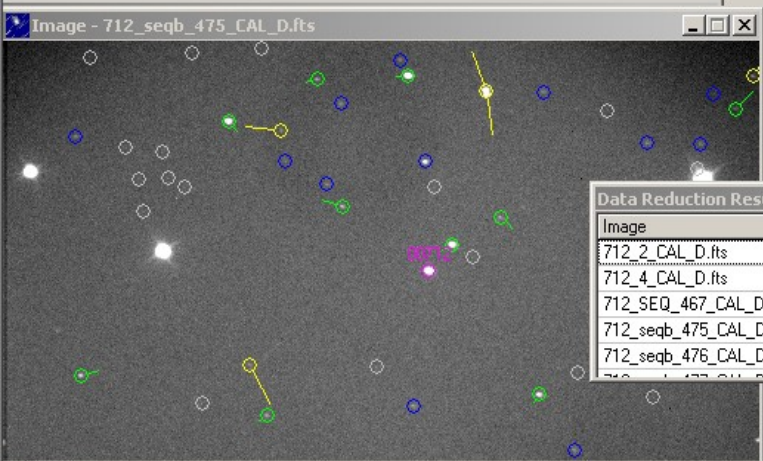
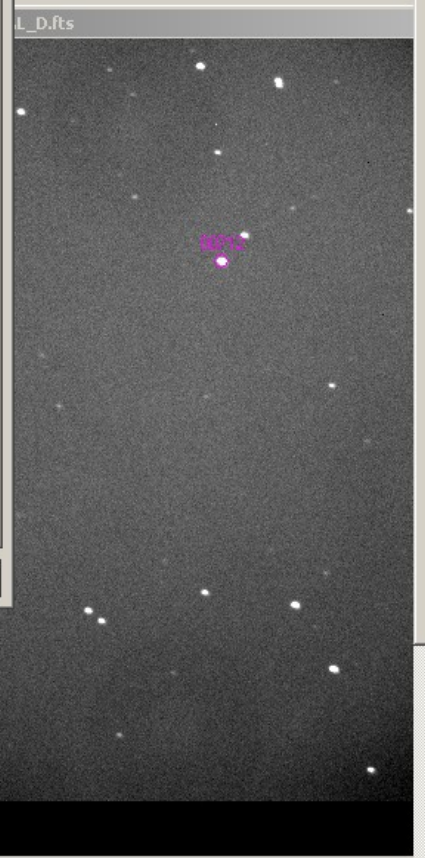
**Residuals**

Astrometric Limit: 0.50 "  
 Photometric Limit: 0.50 mag

**MPC Report**

Include Magnitude  
 Position to 0.001s/0.01"  
 Magnitude to 0.01mag

Open Save Save As OK Cancel



**Data Reduction Results**

Image	Stars	Ref. Stars	Ref./Ast.	Fit Order	dRA	dDe	Ref./Phot.	dmag	Zero Pt.
712_2_CAL_D.fts	49	31	28	1	0.17"	0.15"	24	0.08mag	24.16mag
712_4_CAL_D.fts	45	24	21	1	0.18"	0.08"	19	0.07mag	24.11mag
712_SEQ_467_CAL_D.fts	50	33	27	1	0.14"	0.11"	26	0.08mag	24.13mag
712_seqb_475_CAL_D.fts	50	27	21	1	0.16"	0.11"	21	0.10mag	24.15mag
712_seqb_476_CAL_D.fts	46	28	25	1	0.18"	0.12"	22	0.09mag	24.12mag

# SOLUZIONI PER LA DETERMINAZIONE DELLA PLATE SOLVING

## PLATE SOLVING SYNC

MaxIm DL :

utilizzare la funzione di Plate Solving di Maxim DI per calibrare il GoTo della montatura

In abbinamento con PinPoint,


Ovviamente la soluzione e' abbastanza costosa

Acquisto di MaximDI  
e PinPoint

# Con rete internet : Astrometry.net ( gratis)

<http://nova.astrometry.net>

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## Home

### Explore

Browse images others have been uploading or search for photos of specific astronomical objects.

### Calibrate & Share

Upload your own images to get accurate calibrations and share them with the world.

### Create

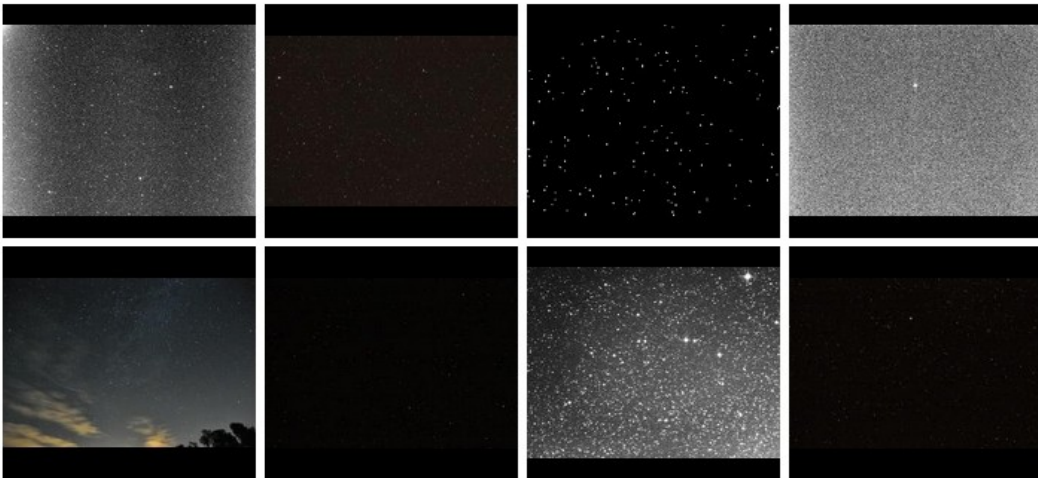
Take advantage of the API of this web service to program your own applications.

### About Astrometry.net

If you have astronomical imaging of the sky with celestial coordinates you do not know—or do not trust—then Astrometry.net is for you. Input an image and we'll give you back astrometric calibration meta-data, plus lists of known objects falling inside the field of view.

We have built this astrometric calibration service to create correct, standards-compliant astrometric meta-data for every useful astronomical image ever taken, past and future, in any state of archival disarray. We hope this will help organize, annotate and make searchable all the world's astronomical information.

### Recently Submitted Images (See More)





# Astrometry.net

## formati grafici compatibili



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### Upload

#### Select a file or url to upload

Nessun file selezionato

file  url

The following file types are supported:

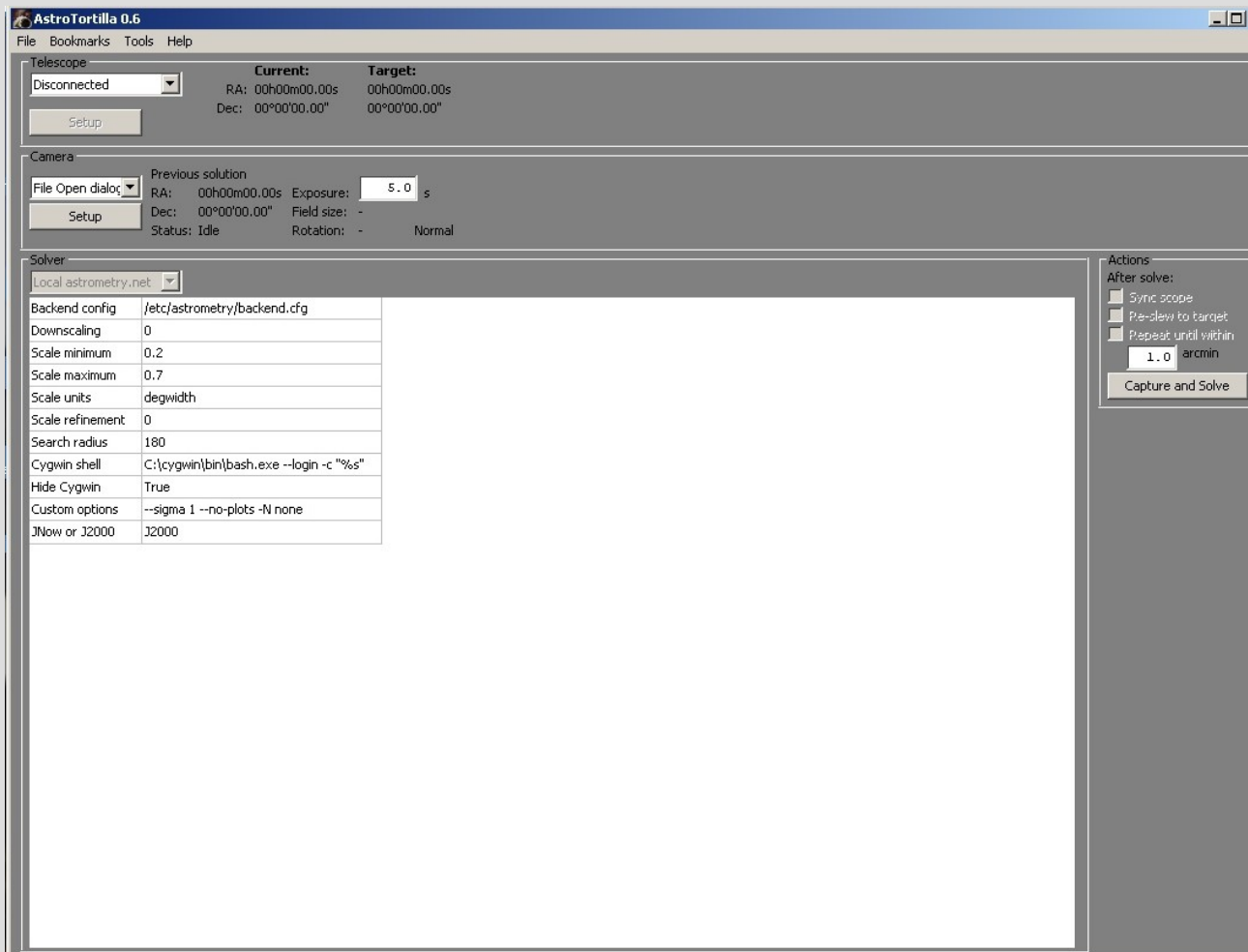
- **JPEG, GIF, PNG, or FITS image**
- **FITS binary table**, containing a BINTABLE of detected objects, with X and Y pixel positions in "D" (double) or "E" (float) columns, with one object per row
- **text list**, containing two columns of digits separated by commas or whitespace, listing the X,Y positions of sources, sorted with the brightest sources first
- **tarball (.tar, .gz)**, containing files of any of the above types

[Advanced Settings \[+\]](#)

# SENZA COLLEGAMENTO INTERNET

## AstroTortilla ( gratis)

### con efficienza veramente impressionante



# FUNZIONI DI ASTROTORTILLA

The screenshot shows the AstroTortilla 0.6 software interface. Red circles and arrows highlight several features:

- Tools Menu:** A red circle around the 'Tools' menu item in the top bar, with an arrow pointing to a dropdown menu containing 'Goto Image', 'Polar alignment', 'Drift shot', and 'Log viewer'.
- Telescope Selection:** A red circle around the 'Telescope' dropdown menu, which is currently set to 'Disconnected'. An arrow points to the 'ASCOM Telescope' option.
- Camera Selection:** A red circle around the 'Camera' dropdown menu, which is currently set to 'File Open dialog'. An arrow points to the 'ASCOM Camera' option.
- Actions Panel:** A red circle around the 'Actions' panel on the right, which includes a 'Capture and Solve' button and a 'Repeat until within' field set to '1.0 arcmin'.

Blue text annotations provide further context:

- POSSIBILITA' DI CONNESSIONE PER MOVIMENTAZIONE TELESCOPIO:** Points to the telescope selection dropdown.
- UTILIZZO DI SOFTWARE DIVERSI:** Points to the camera selection dropdown.
- LETTURA DIRETTA DI UN FILE FTS:** Points to the 'File Open dialog' option in the camera dropdown.

Telescope	Current:	Target:
Disconnected	RA: 00h00m00.00s	00h00m00.00s
Disconnected	Dec: 00°00'00.00"	00°00'00.00"
ASCOM Telescope		

Camera	previous solution	Exposure:
File Open dialog	RA: 00h00m00.00s	5.0 s
Disconnected	Dec: 00°00'00.00"	Field size: -
BackyardEOS	Status: Idle	Rotation: - Normal
Astro Photography		
Screen capture		
MaxIm DL		
ASCOM Camera		
File Open dialog		
Nebulosity 2/3		

Downscaling	Scale minimum	Scale maximum	Scale units	Scale refinement	Search radius	Cygwin shell	Hide Cygwin	Custom options	JNow or J2000
0	0.2	0.7	deg width	0	180	C:\cygwin\bin\bash.exe --login -c "%s"	True	--sigma 1 -no-plots -N none	J2000

# PLATE SOLVING ASTROTORTILLA

**MSB Astroart 5.0**

File Modifica Visualizza Immagine Filtri Matematica Colore Strumenti Plug-in Finestre Aiuto

#4 290\_P\_1998 A570.fit

**AstroTortilla 0.6**

File Bookmarks Tools Help

Telescope: Disconnected  
Current: RA: 00h00m00.00s Dec: 00°00'00.00"  
Target: RA: 00h00m00.00s Dec: 00°00'00.00"

Camera: Previous solution  
File Open dialog: RA: 06h21m29.40s Dec: 35°44'54.64" Exposure: 5.0 s Field size: 17.71' x 17.71' Status: idle Rotation: -168.24 Flipped

Solver: Local astrometry.net

Backend config	/etc/astrometry/backend.cfg
Downscaling	0
Scale minimum	0.2
Scale maximum	0.3
Scale units	degwidth
Scale refinement	0
Search radius	180
Cygwin shell	C:\cygwin\bin\bash.exe --login -c "%s"
Hide Cygwin	True
Custom options	--sigma 1 --no-plots -N none
JNow or J2000	J2000

Actions  
After solve:  
 Sync scope  
 Re-slew to target  
 Repeat until within 1.0 arcmin  
Capture and Solve

Solved in 45.0s

Intestazione #4 290\_P\_1998

```
HISTORY 12 01 2014 21:54:14.839 >
INSTRUME= 'none' /
OBJECT = 'none' /
OBSERVER= 'none' /
EXPOSURE= 20. /
CCD-TEMP= -10.0861499364676 /
APOLY0 = 4.46804288510500000
APOLY1 = 4.46804288510500000
APOLY2 = 0.01745329251994000
APOLY3 = 0.0
APOLY4 = -4.45931623884600000
APOLY5 = 0.0
APOLY6 = 0.01745329251994000
```

COMETA 290P RIPRESA A TAVOLAIA OBSERVATORY IL 12/01/2014  
NEWTON 400 F/5 CCD 512 X 512 DISCOVERY DTA  
SOLUZIONE ASTROMETRICA IN 45 SEC- CAMPO 17.71x17.71'  
flipped e rotazione -168.24

# PLATE SOLVING ASTRO TORTILLA

**MSB Astroart 5.0**  
File Modifica Visualizza Immagine Filtri Matematica Colore Strumenti Plug-in Finestre Aiuto

**AstroTortilla 0.6**  
File Bookmarks Tools Help

Telescope: Disconnected  
Current: RA: 00h00m00.00s Dec: 00°00'00.00"  
Target: RA: 00h00m00.00s Dec: 00°00'00.00"

Camera: File Open dialog Previous solution Exposure: 5.0 s  
RA: 06h21m29.92s Dec: 35°44'58.45" Field size: 17.72' x 17.71'  
Status: Idle Rotation: -168.23 Flipped

Solver: Local astrometry.net

Backend config	/etc/astrometry/backend.cfg
Downscaling	0
Scale minimum	0.2
Scale maximum	0.3
Scale units	degwidth
Scale refinement	0
Search radius	180
Cygwin shell	C:\cygwin\bin\bash.exe --login -c "%s"
Hide Cygwin	True
Custom options	--sigma 1 --no-plots -N none
JNow or J2000	J2000

Actions After solve:  
 Sync scope  
 Re-slew to target  
 Repeat until within 1.0 arcmin  
Capture and Solve

Intestazione #11 290 P\_1998...  
INSTRUME= 'none'  
OBJECT = 'none'  
OBSERVER= 'none'  
EXPOSURE= 20.  
CCD-TEMP= -10.0085957353878  
APOLY0 = 4.46804288510500000  
APOLY1 = 4.46804288510500000  
APOLY2 = 0.01745329251994000  
APOLY3 = 0.0  
APOLY4 = -4.45931623884600000  
APOLY5 = 0.0  
APOLY6 = 0.01745329251994000  
APOLY7 = -4.45931623884600000  
EQUINOX = 2000.0  
CTYPE1 = 'RA---TAN'  
CTYPE2 = 'DEC--TAN'  
CD1\_1 = 1.0  
CD1\_2 = 0.0  
CD2\_1 = 0.0  
CD2\_2 = 1.0  
CROTA1 = 0.0

R = 2094 : 6553

Solved in 26.5s

ALTRO FILE RELATIVO ALLA COMETA  
COMETA 290P RIPRESA A TAVOLAIA OBSERVATORY IL 12/01/2014  
NEWTON 400 F/5 CCD 512 X 512 DISCOVERY DTA  
SOLUZIONE ASTROMETRICA IN SOLI 26,5 SEC  
POICHE' IL PROGRAMMA SAPEVA LA COORDIANTA DI PARTENZA  
RELATIVA ALL'IMMAGINE PRECEDENTE

# PLATE SOLVING ASTROTORTILLA anche su campi non stellari



```

2014-07-05 16:36:19,624 - astrotortilla - INFO
2014-07-05 16:36:19,842 - astrotortilla - INFO
2014-07-05 16:36:19,951 - astrotortilla - INFO
2014-07-05 16:36:20,171 - astrotortilla - INFO
2014-07-05 16:36:20,296 - astrotortilla - INFO
2014-07-05 16:36:21,062 - astrotortilla - INFO
2014-07-05 16:36:21,733 - astrotortilla - INFO
2014-07-05 16:36:22,390 - astrotortilla - INFO
2014-07-05 16:36:23,046 - astrotortilla - INFO
2014-07-05 16:36:23,717 - astrotortilla - INFO - Field 1 did not solve (index index-4205-07.fits, field objects 21-30).
2014-07-05 16:36:24,499 - astrotortilla - INFO - Field 1 did not solve (index index-4205-06.fits, field objects 21-30).
2014-07-05 16:36:25,171 - astrotortilla - INFO - Field 1 did not solve (index index-4205-05.fits, field objects 21-30).
2014-07-05 16:36:25,733 - astrotortilla - INFO - Field 1 did not solve (index index-4205-04.fits, field objects 21-30).
2014-07-05 16:36:26,515 - astrotortilla - INFO - Field 1 did not solve (index index-4205-03.fits, field objects 21-30).
2014-07-05 16:36:27,092 - astrotortilla - INFO - Field 1 did not solve (index index-4205-02.fits, field objects 21-30).
2014-07-05 16:36:27,201 - astrotortilla - INFO - log-odds ratio 41.0243 (6.55597e+17), 9 match, 0 conflict, 20 distractors, 23 index.
2014-07-05 16:36:27,312 - astrotortilla - INFO - RA,Dec = (149.018,69.6257), pixel scale 2.07491 arcsec/pix.
2014-07-05 16:36:27,421 - astrotortilla - INFO - Hit/miss: +-+-----+-----+-----+-----+(best)-----+-----+-----+-----
2014-07-05 16:36:27,529 - astrotortilla - INFO - Field 1: solved with index index-4205-01.fits.
2014-07-05 16:36:27,765 - astrotortilla - INFO - Field size: 17.7576 x 17.6455 arcminutes
2014-07-05 16:36:27,765 - astrotortilla - INFO - Field center: (RA H:M:S, Dec D:M:S) = (09:56:04.413, +69:37:32.307).
2014-07-05 16:36:27,765 - astrotortilla - INFO - Field center: (RA,Dec) = (149, 69.63) deg.
2014-07-05 16:36:27,765 - astrotortilla - INFO - Field: /cygdrive/f/ASTRONOMIA 2013 GENNAIO/IMG20140314TAV/M82_20_SEC__I401.fts
2014-07-05 16:36:27,765 - astrotortilla - INFO - Field 1 solved: writing to file /cygdrive/c/docume~1/user/impost~1/temp/solverxqea8t/3/M82_20_SEC__I401.s
2014-07-05 16:36:27,779 - astrotortilla - INFO - Parsing results...
2014-07-05 16:36:28,701 - astrotortilla - INFO - Solved in 28.1s
2014-07-05 16:37:10,499 - astrotortilla.LogFrame - INFO - Log level changed to 'Debug'
    
```

**AstroTortilla 0.6**  
File Bookmarks Tools Help

Telescope: Disconnected Current: RA: 00h00m00.00s Dec: 00°00'00.00" Target: RA: 00h00m00.00s Dec: 00°00'00.00"  
Setup

Camera: File Open dialog Previous solution RA: 09h55m40.98s Dec: 69°39'11.00" Status: Idle Exposure: 5.0 s Field size: 17.74' x 17.66' Rotation: -168.70 Flipped  
Setup

Solver: Local astrometry.net

Backend config	/etc/astrometry/backend.
Downscaling	0
Scale minimum	0.2
Scale maximum	0.3
Scale units	degwidth
Scale refinement	0
Search radius	180
Cygwin shell	C:\cygwin\bin\bash.exe -
Hide Cygwin	True
Custom options	--sigma 1 --no-plots -N no
JNow or J2000	J2000

Actions  
After solve:  
 Sync scope  
 Pre-slew to target  
 Repeat until within 1.0 arcmin  
Capture and Solve

**DALLA STESSA CARTELLA DI IMMAGINI**

**1) 245 SEC** PRIMA IMMAGINE ANALIZZATA

**2) 45 SEC** SECONDA IMMAGINE ANALIZZATA

**3) 17.4 SEC** TERZA IMMAGINE ANALIZZATA

PERTANTO IL TEMPO DI ELABORAZIONE

MAGGIORE LO IMPIEGA SULLA PRIMA PLATE SOLVING

Solved in 17.4s



## Descrizione funzioni AstroTortilla

### Plate solving

*“Plate solving is the sport of identifying the shapes drawn by the locations of stars in an astronomical image”. ( dal manuale di AstroTortilla)*

*Dopo che sono state identificate le stelle vengono calcolate le coordinate del centro lastra dell'immagine*

*La larghezza del campo di vista di ripresa*

*La rotazione del campo inquadrato*

*E se l'immagine e' diritta o ribaltata rispetto alla griglia delle coordinate celesti*



# Interfacciamento di AstroTortilla con altri software

## controllo camera CCD

Per usare AstroTortilla, occorre un metodo per caricare una immagine astronomica nella memoria del computer

le possibilita' sono le seguenti :

- **MaxIm DL by Diffraction Limited**
- **Nebulosity 2 and 3 by Stark Labs**
- **Astro Photography Tool by Incanus**
- **Screen capture from any other software (like PHD Guiding or BackyardEOS)**
- **Direct connection via ASCOM interface**
- **Manually pointing to an image ( caricando l'immagine direttamente da una cartella del computer)**

# Astrometry.net con procedure implementate in AstroTortilla

## *Astrometry.net*

*The Astrometry.net progetto e' un rivoluzionario progetto che riesce a calcolare la plate solving senza fornire le coordinate iniziali*

*Il motore di ricerca e' libero , algoritmi e codici sono liberi e pubblici*

*Con licenza GNU*

*images is at <http://nova.astrometry.net>. Astrometry.net puo' girare localmente su un computer nei sistemi Linux, Unix, Mac box o Cygwin for Windows indifferentemente*

*AstroTortilla usa una versione locale di Astrometry.net che gira sotto il linguaggio "C" interpretato Cygwin*

*OCCORRONO da 300 Megabytes a 2 Gigabytes di memoria dell'Hard Disk per l'installazione a seconda del campo inquadrato dal telescopio.!!!!*

# Riepilogando ecco le funzioni che abbiamo visto :

The screenshot shows the AstroTortilla 0.6 software interface. Red circles and arrows highlight specific features:

- Tools Menu:** A red circle around the 'Tools' menu in the top bar, with an arrow pointing to a dropdown menu containing 'Goto Image', 'Polar alignment', 'Drift shot', and 'Log viewer'.
- Telescope Selection:** A red circle around the 'Telescope' dropdown menu, which is currently set to 'Disconnected'. An arrow points to the 'ASCOM Telescope' option.
- Camera Selection:** A red circle around the 'Camera' dropdown menu, which is currently set to 'File Open dialog'. An arrow points to the 'ASCOM Camera' option.
- Actions Panel:** A red circle around the 'Actions' panel on the right, which includes checkboxes for 'Sync scope', 'Re-dew to target', and 'Repeat until within', a text input field with '1.0 arcmin', and a 'Capture and Solve' button.

Blue text labels with arrows point to these features:

- POSSIBILITA' DI CONNESSIONE PER MOVIMENTAZIONE TELESCOPIO** (Possibility of connection for telescope movement) points to the Telescope dropdown.
- UTILIZZO DI SOFTWARE DIVERSI** (Use of different software) points to the Camera dropdown.
- LETTURA DIRETTA DI UN FILE FTS** (Direct reading of an FTS file) points to the 'File Open dialog' option in the Camera dropdown.

Telescope	
Current:	Target:
RA: 00h00m00.00s	00h00m00.00s
Dec: 00°00'00.00"	00°00'00.00"

Camera	
previous solution	Exposure: 5.0 s
RA: 00h00m00.00s	Field size: -
Dec: 00°00'00.00"	Rotation: - Normal
Status: Idle	

Configuration	
astrometry/backend.cfg	
Downscaling	0
Scale minimum	0.2
Scale maximum	0.7
Scale units	deg width
Scale refinement	0
Search radius	180
Cygwin shell	C:\cygwin\bin\bash.exe --login -c "%s"
Hide Cygwin	True
Custom options	--sigma 1 -no-plots -N none
JNow or J2000	J2000

# ASTROART5

## Plate solving con Astroart5

Altra soluzione piu' economica ed italiana

Atroart5 (costo circa 150 euro) Msb Software

The screenshot displays the Astroart5 software interface. The main window shows a star field image with a central crosshair. A 'Trova coordinate' dialog box is open in the foreground, containing the following fields and options:

- Zona di ricerca:**
  - Centro (RA-DEC o Nome): 9 55 +69
  - Dimensione (RA-DEC gradi): 60 x 60
  - RA = 09 55 00.0 DEC = +69 00 00
- Immagine:**
  - Campo orizzontale (arcminuti): 17.7
  - Massima rotazione (gradi): 175
  - Pixel rapporto d'aspetto: 1.00
  - Rifletti verticale
- Opzioni:**
  - Stelle di riferimento (minimo): 5

Buttons: Trova, Annulla, Aiuto

Text in the main window: AE UMA 9 h 36 m R.A. 44° 02' Dec

Text in the main window: #4 AEUMAB01\_CAL\_DFd.fts

Text in the main window: PARTENDO DALLE COORDINATE DI M81 3 MINUTI PER CALCOLARE LE COORDINATE IMMAGINE 60 GRADI DI CAMPO DI RICERCA

Text in the main window: Trova coordinate immagine utilizzando pattern stellari Premere F1 per aiuto

Text in the main window: TextEdit: Paragrafo 3, Riga 3, Colonna 1 2,00 / 5,84 : 22,87 x 13,19 \* Pagina 27 / 42 Titolo1 98%

Text in the main window: Start Libero - Google Chrome AAAA plate solving plate solving astro tortil... Astroart 5.0 << 15:37

# PLATE SOLVING ASTROART5

AE UMA 9 h 36 m R.A.  
44° 02' Dec

CONDIZIONE OTTIMALE  
ENTRO 4 GRADI

**Trova coordinate**

Zona di ricerca  
Centro (RA-DEC o Nome)  
9 30 +44  
RA = 09 30 00.0 DEC = +44 00 00  
Dimensione (RA-DEC gradi)  
4 3

Immagine  
Campo orizzontale (arcominuti)  
17.7 + 4 %  
Massima rotazione (gradi)  
180  
Pixel rapporto d'aspetto  
1.00  Rifletti verticale

Opzioni  
Stelle di riferimento (minimo)  
5

Trova Annulla Aiuto

**Trova coordinate**

Zona di ricerca  
Centro (RA-DEC o Nome)  
9 55 +69  
RA = 09 55 00.0 DEC = +69 00 00  
Dimensione (RA-DEC gradi)  
60 60

Immagine  
Campo orizzontale (arcominuti)  
17.7 + 10 %  
Massima rotazione (gradi)  
175  
Pixel rapporto d'aspetto  
1.00  Rifletti verticale

Opzioni  
Stelle di riferimento (minimo)  
5

Trova Annulla Aiuto

CAMPO INQUADRATO  
CON ERRORE MAX 4%

- CIRCA 2-3 SECONDI TEMPO  
DI CALCOLO COORDINATE

PARTENDO DALLE COORDINATE DI M81  
3 MINUTI PER CALCOLARE LE COORDINATE IMMAGINE  
60 GRADI DI CAMPO DI RICERCA

Trova coordinate immagine utilizzando pattern stellari Premere F1 per aiuto

TextEdit: Paragrafo 3, Riga 3, Colonna 1 2,00 / 5,84 22,87 x 13,19 \* Pagina 27 / 42 Titolo1 98%

Start Libero - Google Chrome AAAA plate solving plate solving astro tortill... Astroart 5.0 15:37

# Procedura di PRIMO puntamento telescopio applicata a: Tavolaia Observatory (MPC A29) Stazione Astronomica BS-CR (MPC K47)

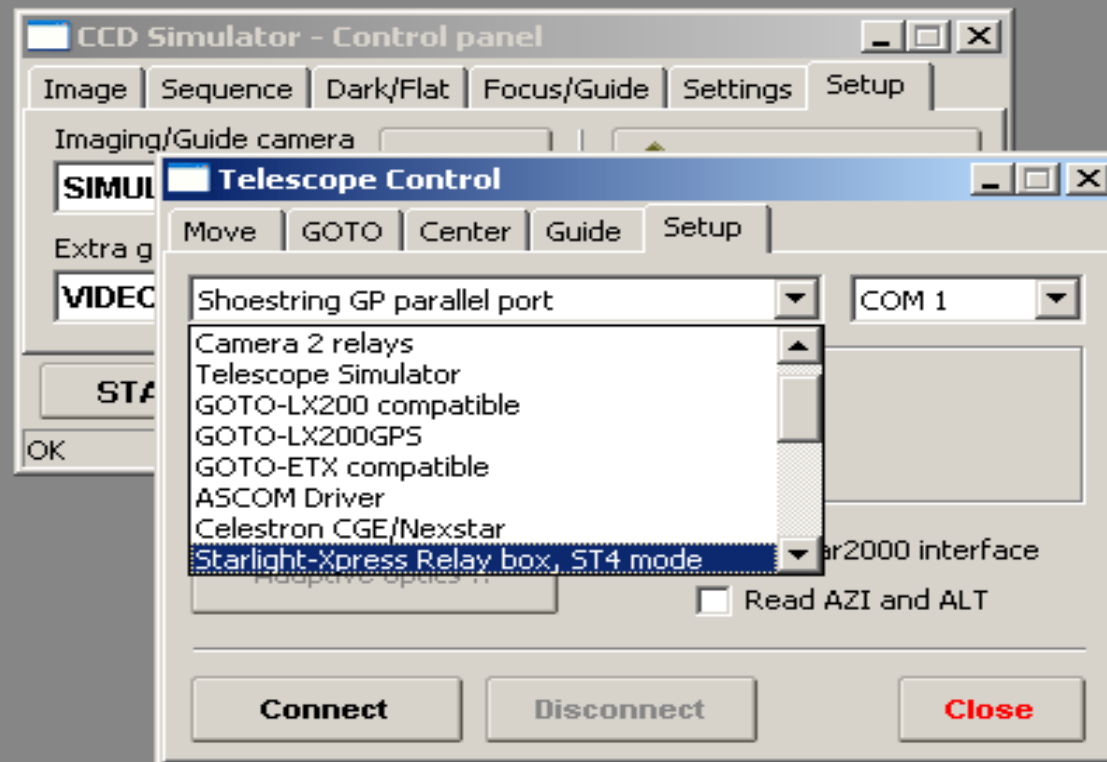
- **Attivazione sistema** ( computer- movimentazione Palomar DTA e CCD ( attivazione raffreddamento CCD)
- **puntamento manuale approssimato** su zona di cielo conosciuta ( preferibilmente stella nel cercatore, non centrata nel crocicchio
- **Calcolo plate solve Astroart5** - per ogni stella del frame vengono calcolate le coordinate A.R. E DEC.- ( con settaggio del campo di ricerca di 4 x 3 gradi di ricerca sull'atlante stellare Astroart5 impiega pochi secondi di tempo per determinare le coordinate , se il telescopio viene puntato su una zona di cielo senza fornire le coordinate il tempo per determinare la posizione puo' essere di 4-7 minuti sulla volta celeste ).
- **Inserimento con script delle coordinate di set posizione del centro lastra** in Astroart5
- Puntamento via software dell'oggetto da riprendere, ***Astroart provvede alla contemporanea gestione del puntamento e del CCD***

Procedura che richiede circa 10-15 minuti (max)

# COMPATIBILITA' DI AstroArt5 CON SISTEMI DI MOVIMENTAZIONE

Astroart permette la gestione dei telescopi con vari protocolli

Per telescopi Meade, Celestron ecc, e i vari driver Ascom, in pratica puo' gestire tutte le montature collegabili ad un software su computer



Vediamo un esempio di calcolo di plate solve  
su un oggetto interessante

## Cometa C2011/J2

ripresa all'Osservatorio di LOIANO- INAF

Il giorno 30 settembre 2014

IL CCD e' raffreddato ad azoto liquido ,

A seguito del sistema criogenico non vengono effettuati i dark

Ma solo serie di bias e flat field

Sigla frame	EXP. SEC	T.U. FRAME
IM_402	60 SEC	2 h 27m 44s
IM_403	60 SEC	2h 31m 52s
IM_404	60 SEC	2h 34m 25s
IM_405	60 SEC	2h 38m 16s
IM_406	60 SEC	2h 41m 18s
n. 6 bias		



# PLATE SOLVE: C2011/J2

## ripresa a LOIANO- INAF 30 SETT 2014

MSB Astroart 5.0 - [#4 Im\_405.fit [50%]]

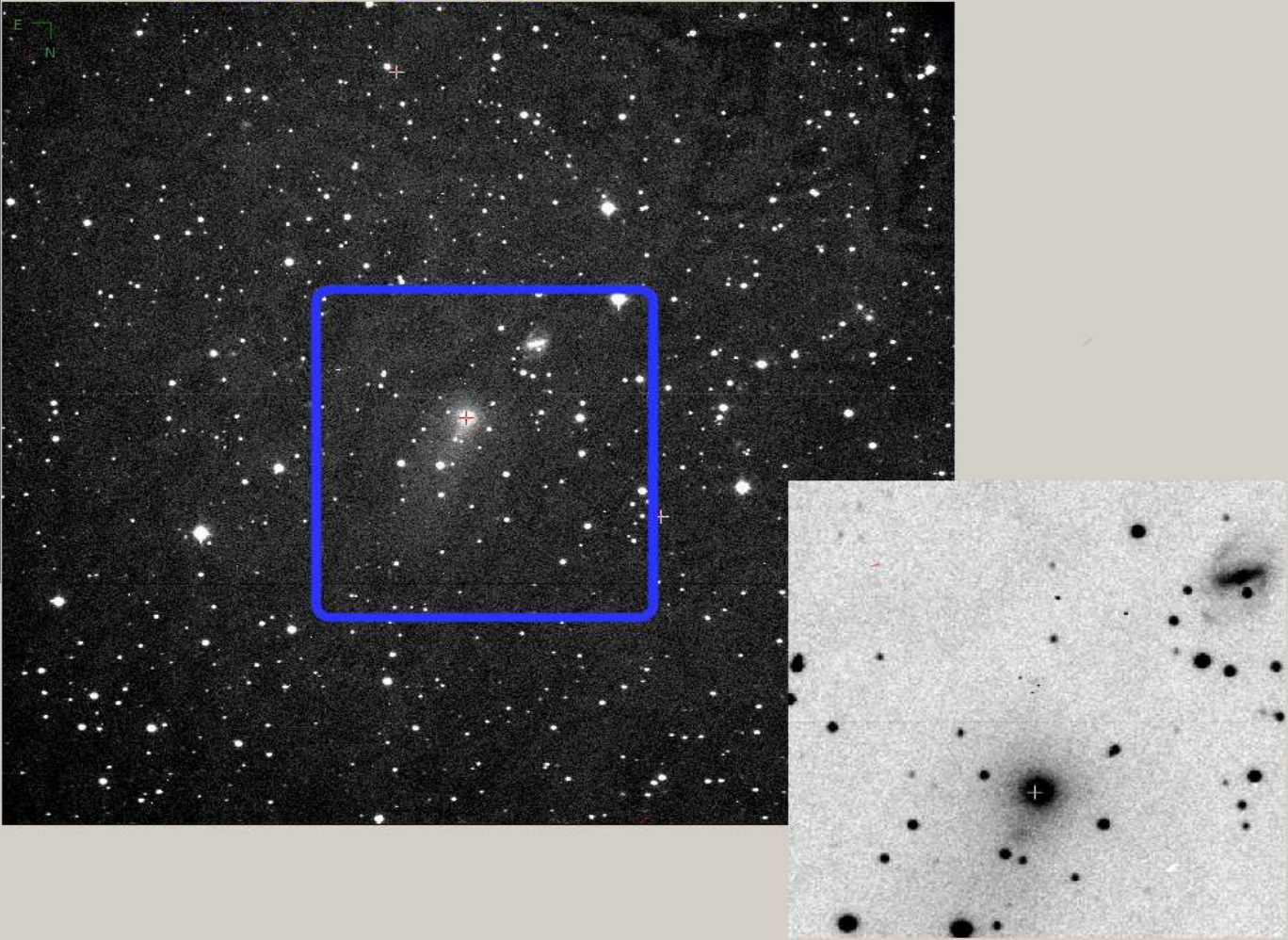
File Modifica Visualizza Immagine Filtri Matematica Colore Strumenti Plug-in Finestre Aiuto

HP LP MS DD CV ME HI

Intestazione #4 Im\_405.fit

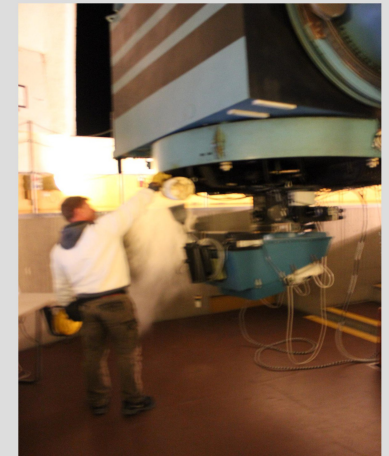
```
SIMPLE = T /
BITPIX = 16 /
NAXIS = 2 /
NAXIS1 = 1340 / Numb
NAXIS2 = 1300 / Numb
BZERO = 32768 / Unsi
BSCALE = 1 /
DATE-OBS= '2014-09-30' / Date
DATE = '2014-09-30' / Date
UT = '02:38:18' / UT a
EXPTIME = 60.0 / Expo
TM-GPS = 9500.2 / 02:3
TM-START= 9498.3 / 02:3
TM-END = 9558.3 / 02:3
RA = '23:15:49' / Tele
DEC = '+43:59:27' / Tele
POSTN-RA= '23:15:49' / Tele
POSTN-DE= '+43:59:27' / Tele
TELESCOP= 'Mt. Orzale 152 cm. Telesco
EPOCH = 0.0 /
INSTRUME= 'BFOSC '
ORIGIN = 'Bologna Astronomical Obser
IMAGETYP= 'object'
DETNAME = 'REV 1300x1340E [NEW] '
OBSERVER= 'Bruni D'Ago'
OBJECT = ' c2011j2 linear'
APERTNR = 1 / EMPT
FILTERS = 1 / empt
FILTRNR = 1 / empt
GRISMNR = 1 / EMPT
JDMID = 2456930.610281 / Juli
AIRMASS = 1.525491 / Airm
ST = '03:58:44' / Side
COMMENT = 'Gain Medium'
```

C2011/J2 BOLOGNA ASTRONOMICAL OBSERVATORY  
riprese : M. BACHINI, I. BRUNI , F. MARTINELLI  
CAMERA "BFOSC" TEL. 152 CM -INAF - STAZ. LOIANO  
U.T. 02 38 18 2014-09-30



R=50:65535 R=2291 V=2239:2664 lin

# Telescopio "CASSINI" Osservatorio di Loiano 152 cm di diametro (circa 9 tonnellate di peso)



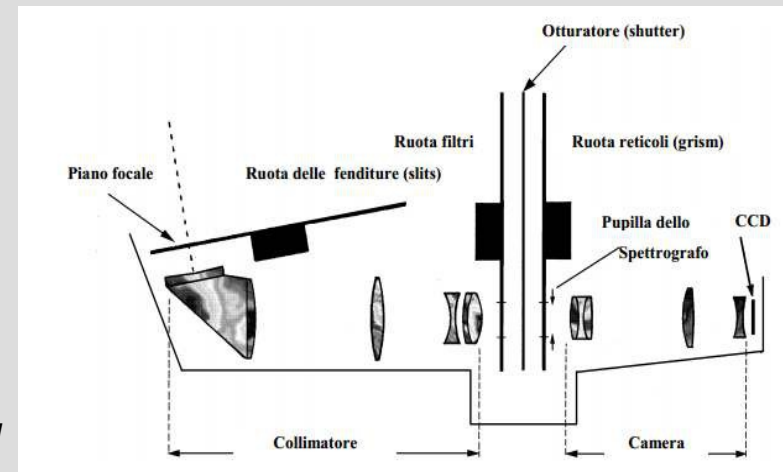
# PLATE SOLVE: COORDINATE C2011/J2

## strumento di ripresa:

**BFOSC - Bologna Faint Object Spectrograph & Camera** - è uno strumento concepito per acquisire, con un semplice cambio di configurazione, sia immagini che spettri. Lo strumento è attualmente in dotazione in vari telescopi: Osservatorio Astronomico di Copenaghen, Osservatorio Astronomico di Asiago, Istituto di Astrofisica di Andalusia, ESO.

*Le principali caratteristiche dello strumento sono le seguenti:*

<b>Lunghezza focale del collimatore:</b>	<b>252.1 mm</b>
<b>Campo lineare del collimatore:</b>	<b>52.9 x 52.9 mm</b>
<b>Diametro del fascio:</b>	<b>31.5 mm</b>
<b>Lunghezza focale della camera:</b>	<b>146.3 mm</b>
<b>Campo lineare della camera:</b>	<b>30.7 x 30.7 mm</b>
<b>Rapporto di riduzione:</b>	<b>0.58</b>
<b>Copertura spettrale:</b>	<b>330 , 1100 nm</b>
<b>Risoluzione spettrale massima:</b>	<b>4200</b>
<b>Dimensione proiettata del pixel:</b>	<b>0.58 arcsec/pixel</b>
<b>Dimensioni campo:</b>	<b>13' x 12.6' *</b>



\* utilizzando il CCD EEV D129915

**Il BFOSC in caso di guasto del detector EEV potrà essere utilizzato con il CCD Thomson 1024 x 1024. Con tale configurazione le dimensioni di campo diverranno di 9.6' x 9.6' con una dimensione proiettata di 0.562 arcsec/pixel.**

( Dati INAF )

## CARATTERISTICHE DEL CCD EEV ( dati Inaf)

Detector EEV LN/1300-EB/1

Controller Photometrics Series ST133B/100 KHz and 1 MHz

Array 1300x1340 pixels

Special Features coating AR Visar, back illuminated

Quantum Efficiency 80% @ 500 nm, 32% @ 900 nm, >50% @ 300 nm

Pixel size 20x20 micron

Pixel scale 0.58 arsec/pixel

Field of View 13'x12.6'

Read-out time 2 sec @ 1 MHz, 18 sec @ 100 KHz ( standard work: 100KHz )

Read-out noise 6.10 e-/px @ 1 MHz, 3.06 e-/px @ 100 KHz ( standard work: 100 KHz )

Conversion factor 2.48 e-/ADU @ 1 MHz, 2.22 e-/ADU @ 100 KHz

Dynamical range 16 bit

Full-well capacity Sensitivity mode: 117000 elettrons

Response Nonlinearity < 1% for 16 bit @ 100 Khz

Response Nonuniformity < ± 4% over entire ccd area

Operating temperature -100 °c

Immage processing software Winview, on line

Output data format Fits

Dimension image 3.5 Mbyte

CCD Array

Priceton Instruments exclusive; MPP

only: VIS/AR coating standard;

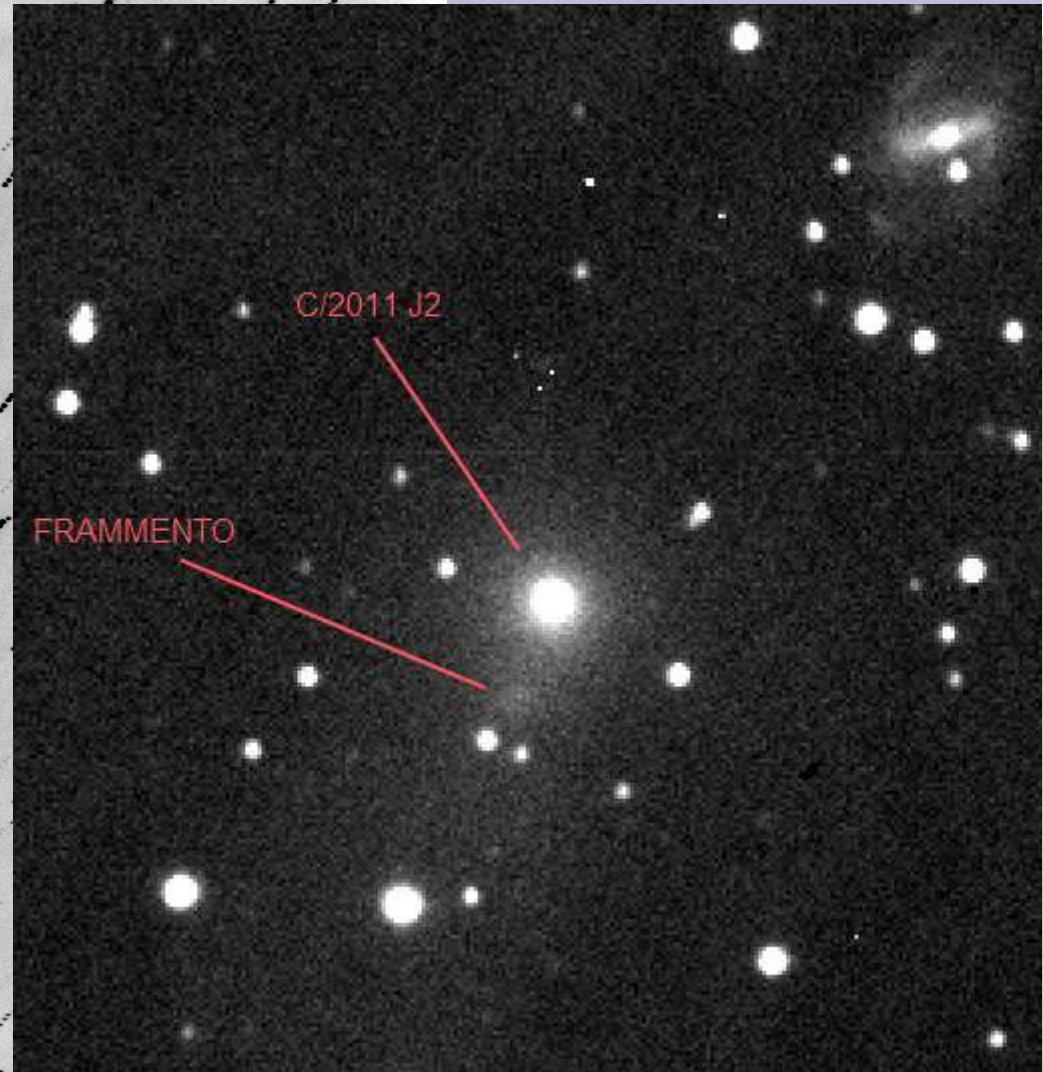
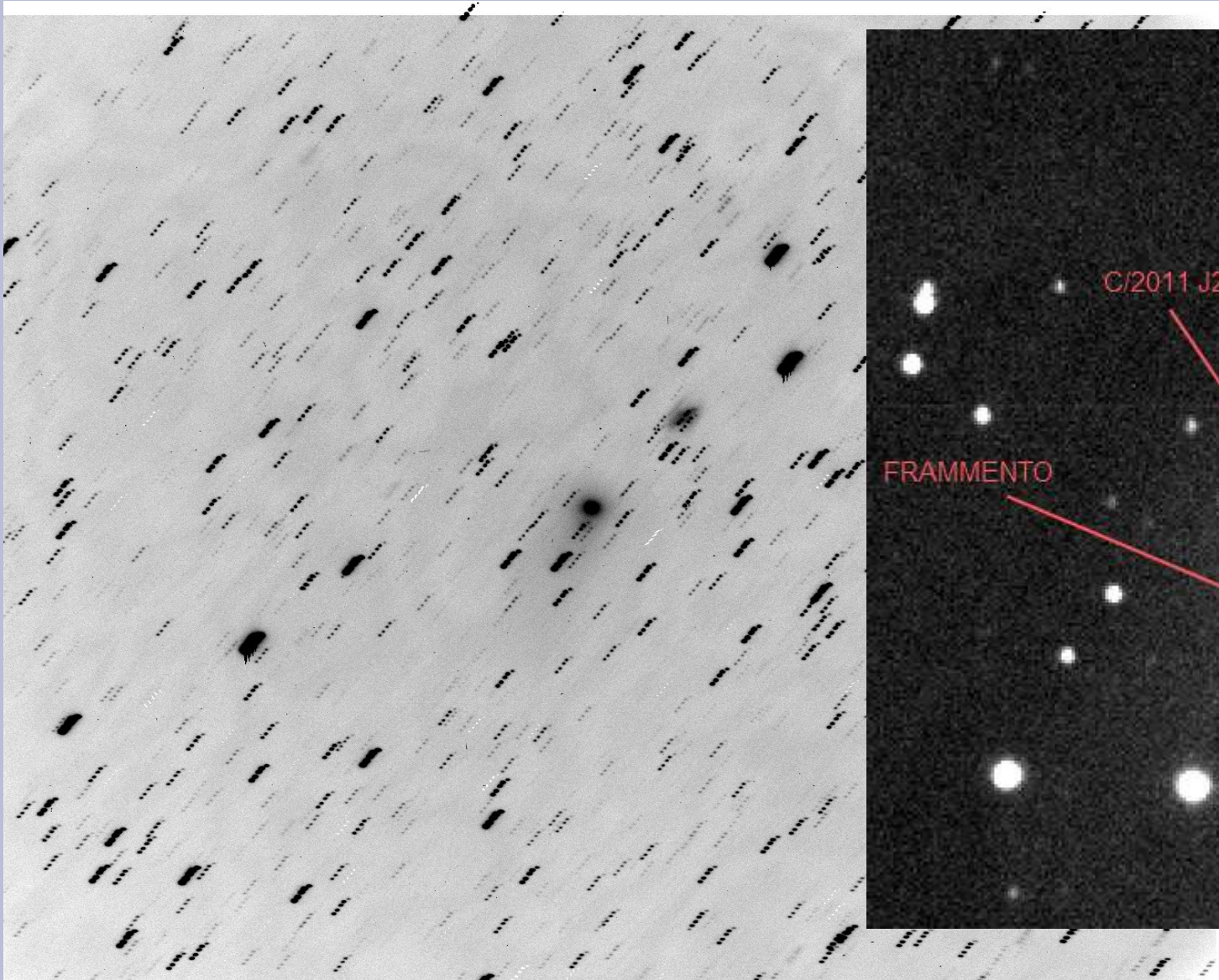
Format

1340x1300; 26.8x26.0 mm

overall; 20x20 pixels

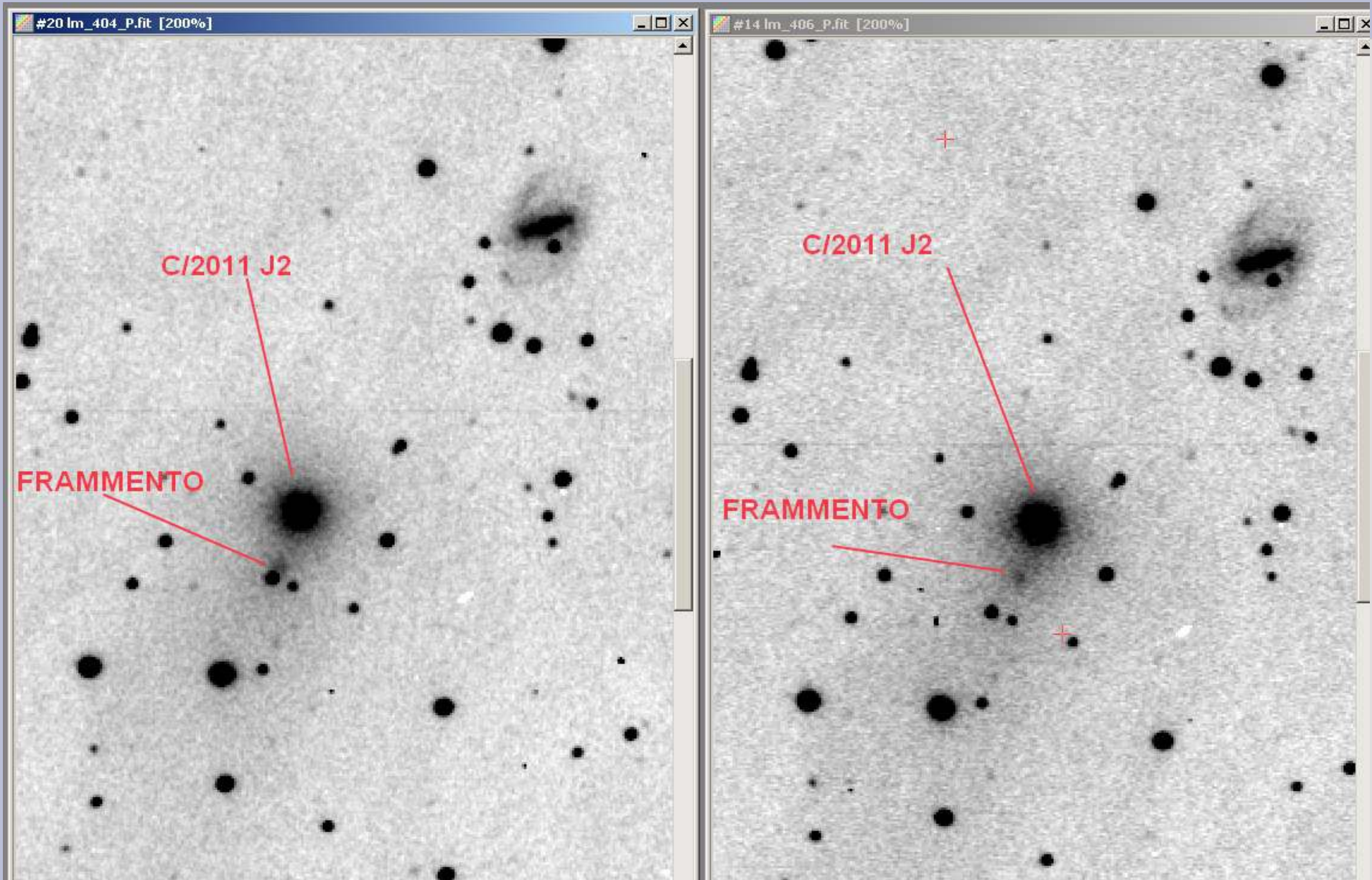
**C2011/J2**

**ripresa a LOIANO- INAF 30 SETT 2014**



# C2011/J2

ripresa a LOIANO- INAF 30 SETT 2014



# C2011/J2

## ripresa a LOIANO- INAF 30 SETT 2014

### Trova coordinate

Zona di ricerca

Centro (RA-DEC o Nome)

Dimensione (RA-DEC gradi)

RA = 23 15 00.0 DEC = +43 00 00

Immagine

Campo orizzontale (arcminuti)   % 

Massima rotazione (gradi)

Pixel rapporto d'aspetto   Rifletti verticale

Opzioni

Stelle di riferimento (minimo)

### #14 Im\_406\_P.fit [200%]

COMETA C/2011 J2

CROCCICCHIO CENTRO LASTRA

R = 8 : 65535 B = 2326 V = 2288 : 2711 Lin

A.R. = 23 14 41.099  
DEC. = +43 53 55.24  
COORDINATE A.R. E DEC  
FRAMMENTO

#5 Bias02.fit #6 Bias03.fit #10 Bias04.fit

RA DEC = 348.671246 +43.898679 23 14 41.099 +43 53 55.24 X = 650 Y = 623 Valore = 2611

# Script ASTROART5 per puntamento automatico telescopio

The screenshot displays the MSB Astroart 5.0 software interface, which is used for controlling a telescope and processing images. The main window shows a simulated telescope view with a bright star and a green crosshair. The current position is RA: 02 52 52.2 and DEC: +21 16 39. A 'Trova' (Find) dialog box is open, showing the search criteria for NGC 3034 (M 82) and its coordinates: RA, DEC: 09 58 54.041 +69 56 52.72. The 'Trova' dialog also includes a grid of letters (A-I, J-R, S-Z) and a numeric keypad for coordinate entry. The 'Telescope Control' panel on the right shows the current position [RA, DEC - AZI, ALT] as 02 52 52.2 +21 16 39 and 000 00 +00 00. The 'Atlante stellare' (Star Atlas) window shows a star field with a white oval highlighting the target star, NGC 3034 = M 82. The bottom status bar shows the current date and time: 14:41.

MSB Astroart 5.0

File Modifica Visualizza Immagine Filtri Matematica Colore Strumenti Plug-in Finestre Aiuto

Telescope Simulator  
Resync  
Connected  
RA: 02 52 52.2  
DEC: +21 16 39

CCD Simulator - Control panel  
Image | Sequence | Dark/Flat | Focus/Guide | Settings | Setup  
Imaging/Guide camera: SIMULATOR SETUP  
Extra guide camera: VIDEO SETUP  
Telescope ...  
Filter Wheel ...  
Help Options  
START 3.0  
Options 1 Options 2 Script source Script output  
Run Stop Recent Menu  
n = Telescope.List.Count

Telescope Control  
Move | GOTO | Center | Guide | Setup  
STOP  
Step (seconds): 1.5 Y, 1.5 X  
Speed: 1 - Guide, 2 - Center, 3 - Find, 4 - Slew  
Emulate with GOTO  
Current position [RA, DEC - AZI, ALT]: 02 52 52.2 +21 16 39 000 00 +00 00

Atlante stellare  
GSC USNOB  
RA DEC = 09 58 54.041 +69 56 52.72 Campo = 46' x 34'

Trova  
NGC, IC, Messier, RA DEC  
M 82 Immagine corrente  
RA, DEC  
Messier  
09 55 53.017 +69 40 46.49  
09.93139 +69.67958  
148.97090° +69.67958  
Planetini (UT)  
2014 12 6 7 0 0  
Tempo dell'immagine MPCORB OK  
Trova Annulla Aiuto

Start Astroart image processin... DATI SOMMASX60SNEGATIVE ... plate solving AstroArt5.p... Astroart 5.0 pagina\_puntamento\_scri... 14:41



# Script ASTROART5 per puntamento automatico telescopio

The screenshot displays the MSB Astroart 5.0 software interface, which is used for controlling a telescope and camera system. The main window is divided into several panels:

- Telescope Simulator:** Shows a 3D model of a telescope with the status "Resync Connected". It displays RA: 02 52 52.2 and DEC: +21 16 39.
- CCD Simulator - Control panel:** Contains controls for the camera, including "Imaging/Guide camera" (set to SIMULATOR) and "Extra guide camera" (set to VIDEO). It has "SETUP" buttons for both and a "START" button. A script editor is open, showing a VBA script for automatic pointing.
- Telescope Control:** Features a "Move" tab with "GOTO" and "Center" options. It has a field for "NGC-IC-UGC-Messier or RA-DEC Coordinates" (set to M 1) and a "GO" button. Below is a table of star coordinates.
- Image Window:** Displays a dark field of stars with a bright central object. The coordinates are RA=1260:33425, B=5270, V=2780:17014 Lin.

The script in the CCD Simulator panel is as follows:

```
n = Telescope.List.Count
for i = 1 to n
  ra = Telescope.List.Ra(i)
  de = Telescope.List.Dec(i)
  name$ = Telescope.List.Name$(i)
  print "oggetto "; name$
  print "ra= ";ra
  print "de= ";de

  Telescope.Goto(ra,de)
  Telescope.Wait
  Pause(5)
  print" riprende immagine e stampa a video"
```

An "Apri" (Open) dialog box is also visible, showing a search for "ASTROART COORDINATE GALASSIE 2014" and a list of files, including "coordinate 10h-11h".

N	Name	RA	DEC
1	ngc3153	10 12 50.0	+12 40 00
2	ngc3367	10 46 34.0	+13 45 03
3	ngc3154	10 13 01.0	+17 02 03
4	ngc3239	10 25 04.0	+17 09 49
5	ngc3227	10 23 30.0	+19 51 54
6	ngc3303	10 37 00.0	+18 08 09
7	ngc3177	10 16 34.0	+21 07 23

```

coordinate 14h-15h_astroat - Blocco note
File Modifica Formato Visualizza ?

LISTA PUNTAMENTO GALASSIE PROVA |
ngc5427 14 03 26 -06 01 44// Iota Virgo-Gamma Bootes
ngc5468 14 06 35 -05 27 10
ngc5506 14 13 15 -03 12 27
ngc5604 14 24 43 -03 12 43
ngc5618 14 27 12 -02 15 44
ngc5584 14 22 24 -00 23 15
ngc5713 14 40 11 -00 17 23
ngc5740 14 44 24 +01 40 47
ngc5725 14 40 58 +02 11 12
ngc5718 14 40 43 +03 27 56
ngc5638 14 29 40 +03 14 01
ngc5576 14 21 04 +03 16 16
ngc5566 14 20 20 +03 55 60
ngc5619 14 27 18 +04 48 11
ngc5679 14 35 09 +05 21 33
ngc5645 14 30 39 +07 16 30
ngc5685 14 32 26 +08 04 46
ngc5689 14 32 44 +09 53 30
ngc5644 14 30 25 +11 55 41
ngc5591 14 22 33 +13 43 02
ngc5600 14 23 50 +14 38 20
ngc5522 14 14 50 +15 08 48
ngc5504 14 12 16 +15 50 31
ngc5490 14 09 57 +17 32 44
ngc5492 14 10 35 +19 36 44
ngc5513 14 13 09 +20 24 59
ngc5581 14 21 16 +23 28 48
ngc5523 14 14 52 +25 19 03
ngc5629 14 28 16 +25 50 59
ngc5635 14 28 32 +27 24 33
ngc5641 14 29 17 +28 49 19
ngc5657 14 30 44 +29 10 51
ngc5639 14 28 47 +30 24 46
ngc5653 14 30 11 +31 12 54
ngc5611 14 24 05 +33 02 51
ngc5421 14 01 41 +33 49 37
ngc5440 14 03 01 +34 45 25
ngc5533 14 16 08 +35 20 37
ngc5579 14 20 26 +35 11 20
ngc5614 14 24 08 +34 51 32
ngc5656 14 30 26 +35 19 16
ngc5616 14 24 21 +36 27 41
ngc5544 14 17 03 +36 34 18
ngc5596 14 22 29 +37 07 20
ngc5684 14 35 50 +36 32 35
ngc5698 14 37 15 +38 27 15
ngc5754 14 45 20 +38 43 52
ugc 9376 14 33 47 +40 04 52
ngc5603 14 23 02 +40 22 39
ugc 9585 14 53 52 +42 33 47
ngc5730 14 39 52 +42 44 33
ugc 9476 14 41 32 +44 30 46
ngc5767 14 49 34 +47 22 34

```

LISTA IN FILE DI TESTO  
COORDINATE "OGGETTI DA PUNTARE"

```

script_mauro_centro_22_giugno - Blocco note
File Modifica Formato Visualizza ?

n = Telescope.List.Count
for i = 1 to n|
  ra = Telescope.List.Ra(i)
  de = Telescope.List.Dec(i)
  name$ = Telescope.List.Name$(i)
  print "oggetto "; name$
  print "ra= ";ra
  print "de= ";de
  Telescope.Goto(ra,de)
  Telescope.Wait
  Pause(5)
  print " riprende immagine e stampa a video"
  Camera.Start(20)
  Camera.Wait
  Pause(5)
  nstars=5
  Image.FindCoordinates(ra,de,nstars)
  dist = Image.DistanceFrom(ra,de)
  print "dist Image.DistanceFrom(ra,de)";dist
  if dist > 0.1 then
    print "Centering telescope..."
    Telescope.SyncTo(Image.RA,Image.DEC)
    Telescope.Goto(ra,de)
    Telescope.Wait
  endif
  print "salva immagine "
  Image.Save("C:\Temp\" + name$ + ".fit")
  print " "
  print " "
  Print "-----"
  print " "
next i
print "fine script "

```

N STELLE LISTA

PRINT  
R.A. E DEC.  
STELLE LISTA

PUNTAMENTO TEL.

RIPRESA  
IMMAGINI GALASSIE

PARAMETRO STELLE

CALCOLO  
COORDINATE  
CENTRO LASTRA  
E CONTROLLO  
DELLE COORD.  
DELLE COORD.  
OGGETTO

RICONTROLLO  
COORDINATE  
CENTRO  
IMMAGINI

# Buone osservazioni e cieli sereni.....



Grazie per l'attenzione

