Guida galattica per astrometristi cometari

L’astrometria è l’arte di misurare la posizione degli oggetti celesti.
Nel caso degli asteroidi, si aggiunge la difficoltà del movimento.
Nel caso delle comete, al movimento si aggiunge la presenza della chioma, che nasconde la reale posizione del nucleo.

Si può quindi procedere in due modi:

1) Far finta che le comete non esistano ed abbandonarle al loro destino;

2) Cercare di minimizzare gli effetti della chioma

«Lontano, nei dimenticati spazi non segnati nelle carte geografiche dell'estremo limite della Spirale Ovest della Galassia, c'è un piccolo e insignificante sole giallo. A orbitare intorno a esso, alla distanza di centoquarantanove milioni di chilometri, c'è un piccolo, trascurabilissimo pianeta azzurro-verde, le cui forme di vita, discendenti dalle scimmie, sono così incredibilmente primitive che credono ancora che gli orologi da polso digitali siano un'ottima invenzione.»

Buone pratiche astrometriche:

- Osservare in condizioni di buon seeing (per quanto possibile)

- Controllare la messa a fuoco

- Utilizzare un corretto campionamento

- Massimizzare il segnale/rumore

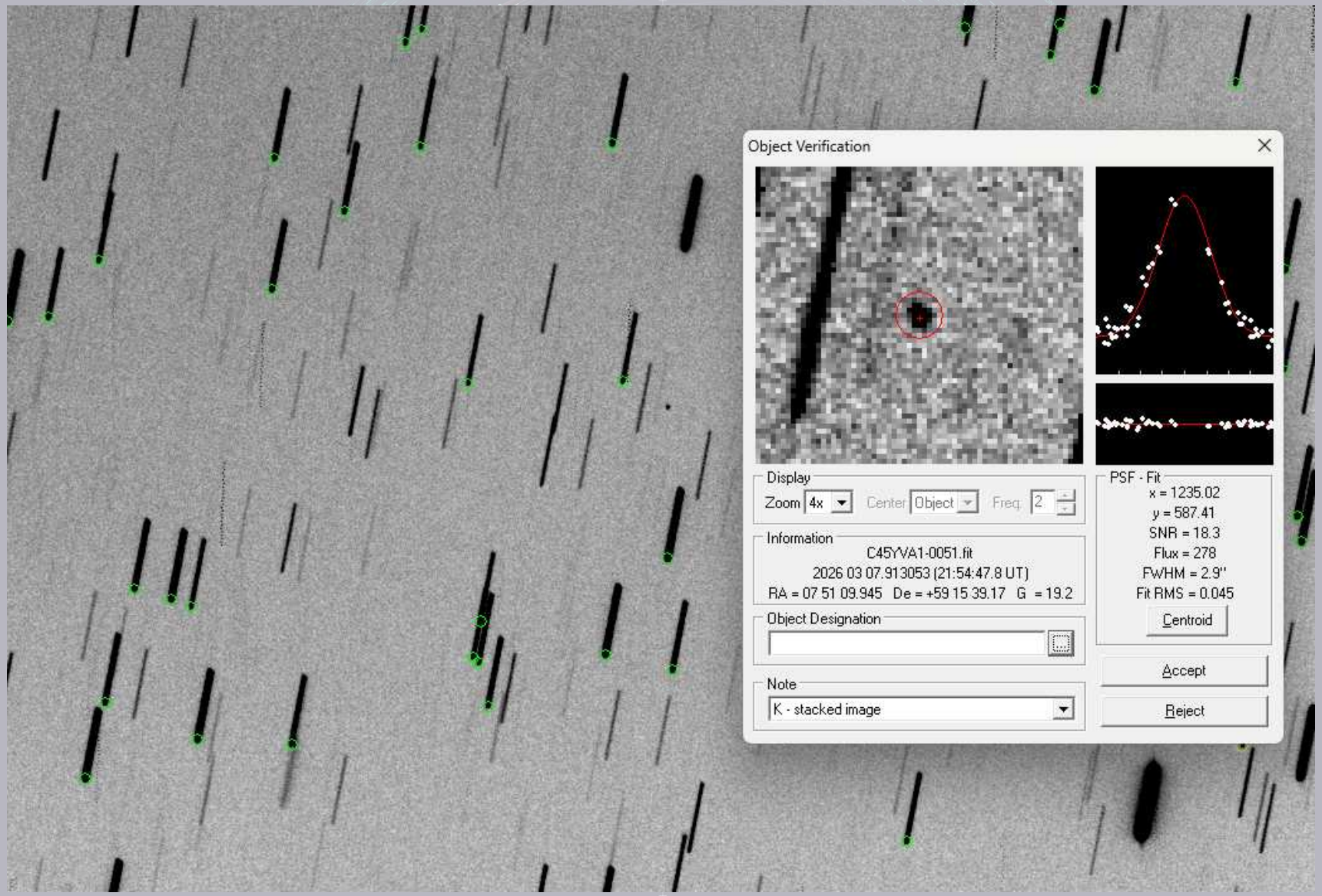
- Scegliere il migliore catalogo astrometrico

- Controllare l’accuratezza del timing del sistema (PC + errori sistematici)

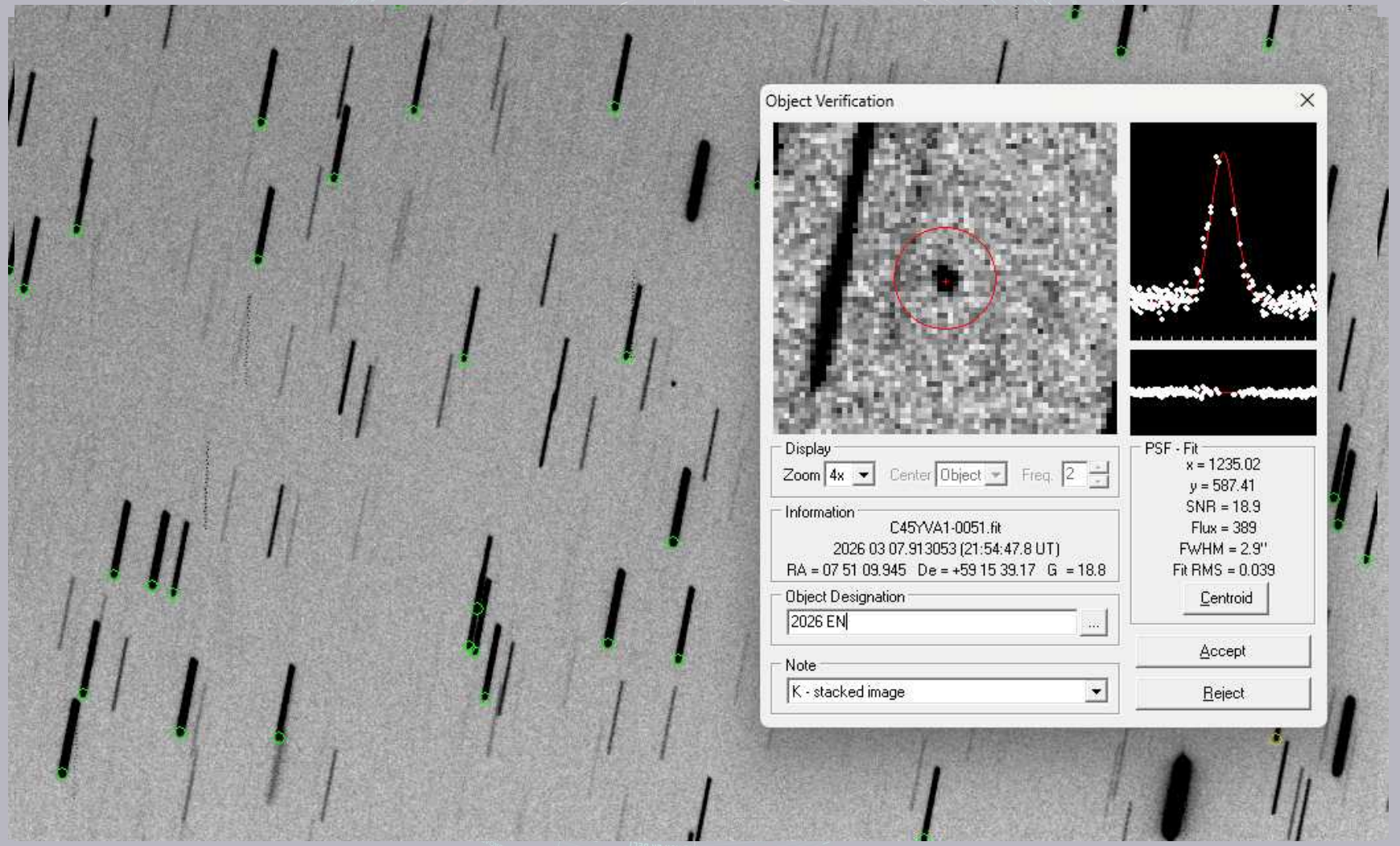
- In caso di somma/media/mediana, utilizzare il motion vector corretto

- Pretrattare le immagini

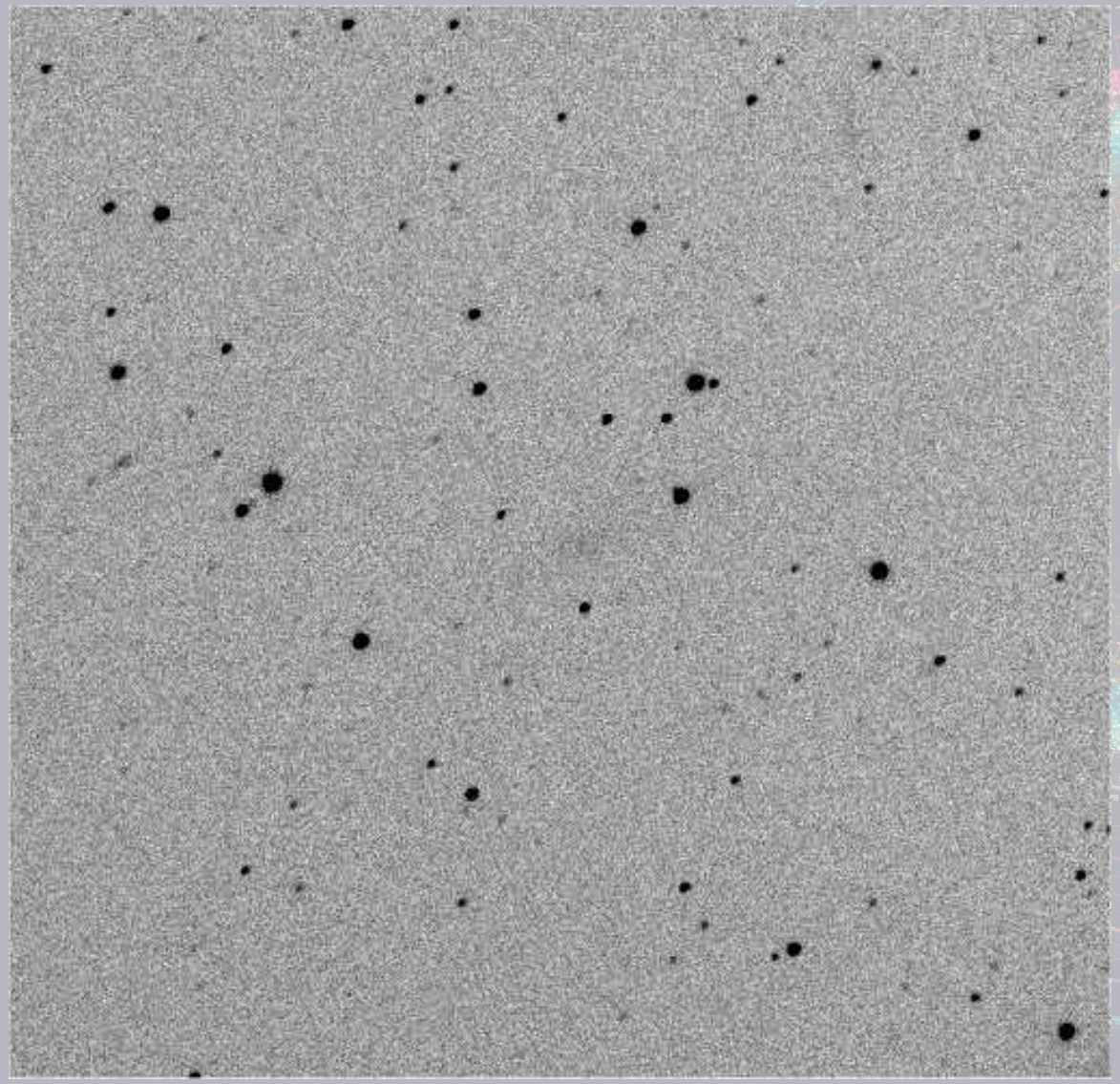
Asteroidi vs comete

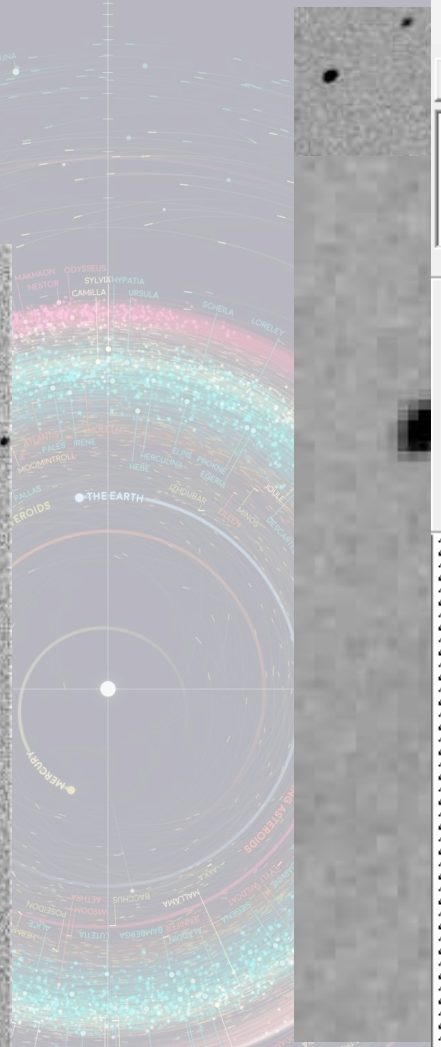


Asteroidi vs comete



Asteroidi vs comete





FIND_ORB Orbit Determination Software

Open...

P/210

Perturbers:
Mercu Mars Uranu
Venu: Jupite Neptu
Earth Satur Pluto
Moon Asteroids
All Perturbers Off

Epoch 2026 Feb 26

R1: 1.1008 AU

R2: 1.2365 AU

About...
Herget step
Full step
Vaisala
Auto-Solve
Save Residuals..
Save elements
Ephemeris...
Settings
Monte Carlo...
Stat Ranging
Simplex
Gauss
Worst obs
Filter obs
Toggle Obs
Set Sigma(s)
Exit

Orbital elements: P/210
Perihelion 2025 Nov 22.725627 +/- 3.59e-5 TT = 17:24:54 (JD 2461002.22562
Epoch 2026 Feb 26.0 TT = JDT 2461097.5 Earth MOID: 0.1725 Ju: 0.0195
M 16.71409179 +/- 0.00022 Ve: 0.0605 Find_Orb
n 0.17543113 +/- 2.43e-6 Peri. 345.94791 +/- 0.00017
a 3.16032388 +/- 2.92e-5 Node 93.79671 +/- 0.00017
e 0.8340646 +/- 1.8e-6 Incl. 10.28735 +/- 0.000031
P 5.62 M(N) 16.3 K 10.0 U 4.1
q 0.52440947 +/- 8.91e-7 Q 5.79623829 +/- 5.92e-5
From 287 observations 2025 July 20-2026 Feb. 26; mean residual 0".89

2512 28.22865	A77	14 59 59.74	-08 29 14.5	.47-	.03-
2512 28.23215	A77	15 00 00.11	-08 29 14.5	.33-	.04+
2512 28.23566	A77	15 00 00.41	-08 29 15.3	1.2-	.70-
2512 29.21597	G00	15 01 42.71	-08 29 31.3	.24-	.41+
2512 29.21999	G00	15 01 43.15	-08 29 31.6	.21+	.20+
2512 29.22400	G00	15 01 43.54	-08 29 31.3	.06-	.59+
2512 29.826840	Q21	15 02 46.073	-08 29 42.86	.09+	.29-
2512 29.830347	Q21	15 02 46.438	-08 29 42.73	.24+	.07-
2512 29.834213	Q21	15 02 46.852	-08 29 42.46	.57+	.30+
2512 30.22590	L27	15 03 27.05	-08 29 51.6	.01+	.32+
2512 30.23342	L27	15 03 27.81	-08 29 51.7	.04+	.41+
2512 30.24095	L27	15 03 28.56	-08 29 51.8	.07-	.50+
2512 30.835104	Q21	15 04 29.450	-08 30 04.51	.02-	.25+
2512 30.840359	Q21	15 04 29.939	-08 30 04.72	.56-	.18+
2512 30.845602	Q21	15 04 30.491	-08 30 04.82	.15-	.23+
2512 31.772639	Q21	15 06 04.544	-08 30 26.46	.88-	.10+
2512 31.777882	Q21	15 06 05.084	-08 30 26.64	.63-	.07+
2512 31.783137	Q21	15 06 05.629	-08 30 26.28	.31-	.59+
2512 31.788391	Q21	15 06 06.149	-08 30 26.47	.36-	.55+
2601 01.647451	T05	15 07 32.278	-08 30 46.01	.17-	.24+
2601 01.655189	T05	15 07 33.036	-08 30 45.86	.12-	.62+
2601 01.659261	T05	15 07 33.444	-08 30 45.86	.04+	.74+
2601 01.673907	T05	15 07 34.891	-08 30 46.84	.37+	.18+
2601 07.594034	T05	15 17 00.326	-08 32 43.30	.69-	.43+
2601 07.597672	T05	15 17 00.650	-08 32 43.37	.73-	.42+
2601 07.607748	T05	15 17 01.550	-08 32 42.97	.77-	1.0+
2601 07.622292	T05	15 17 02.858	-08 32 43.80	.65-	.41+
2602 26.150089	204	15 51 17.149	-06 12 05.88	1.1-	.56-

Click on an observation to get information about it. Right-click to get further options. Ctrl-click to select multiple observations.
Version Mar 17 2019
No JPL DE ephemeris file loaded; using (slower) PS1996 series
See https://www.projectpluto.com/find_orb.htm#de_eph for info on how/why to use JPL DE ephemerides

210P – 26/02/2026 - 30

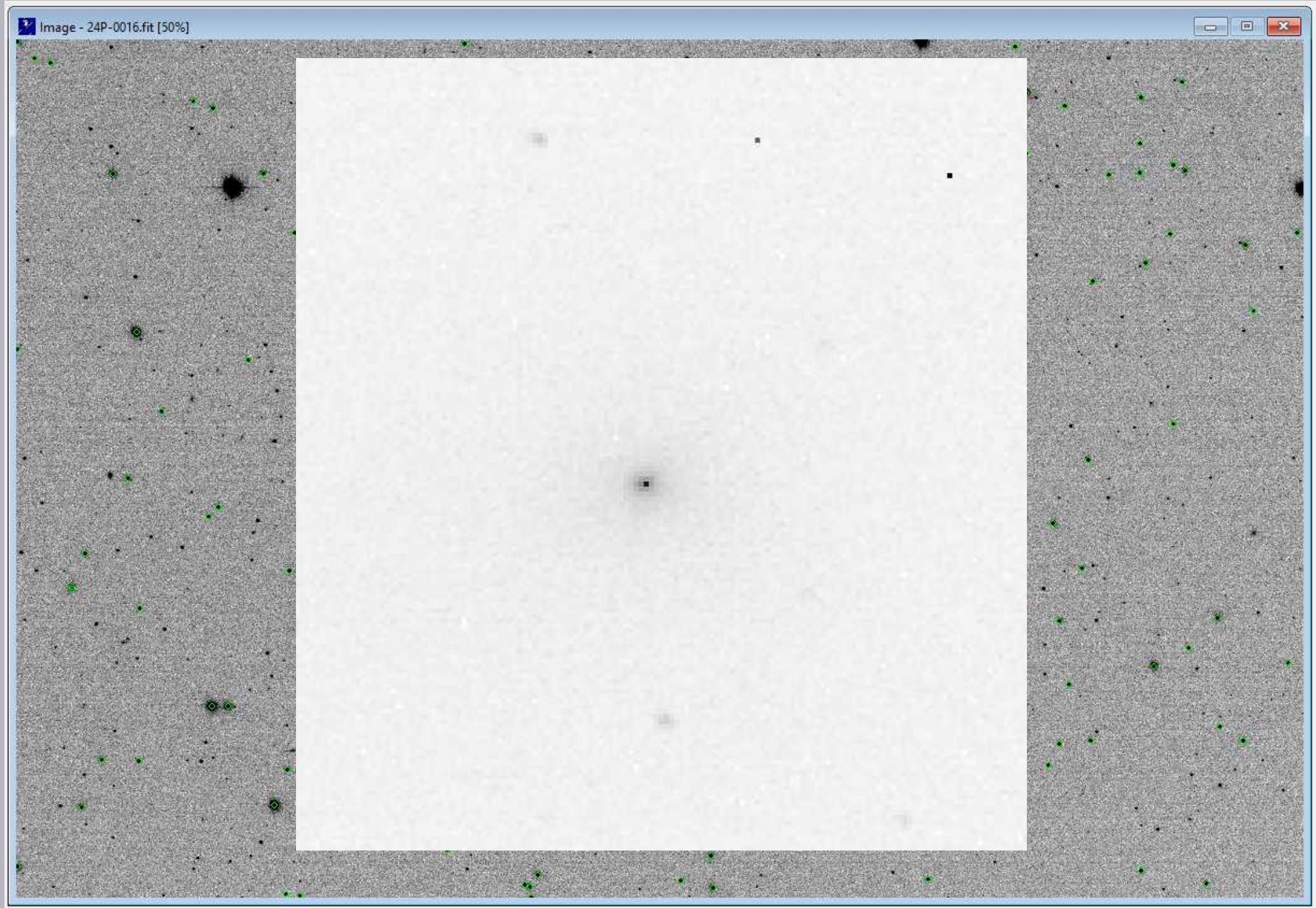
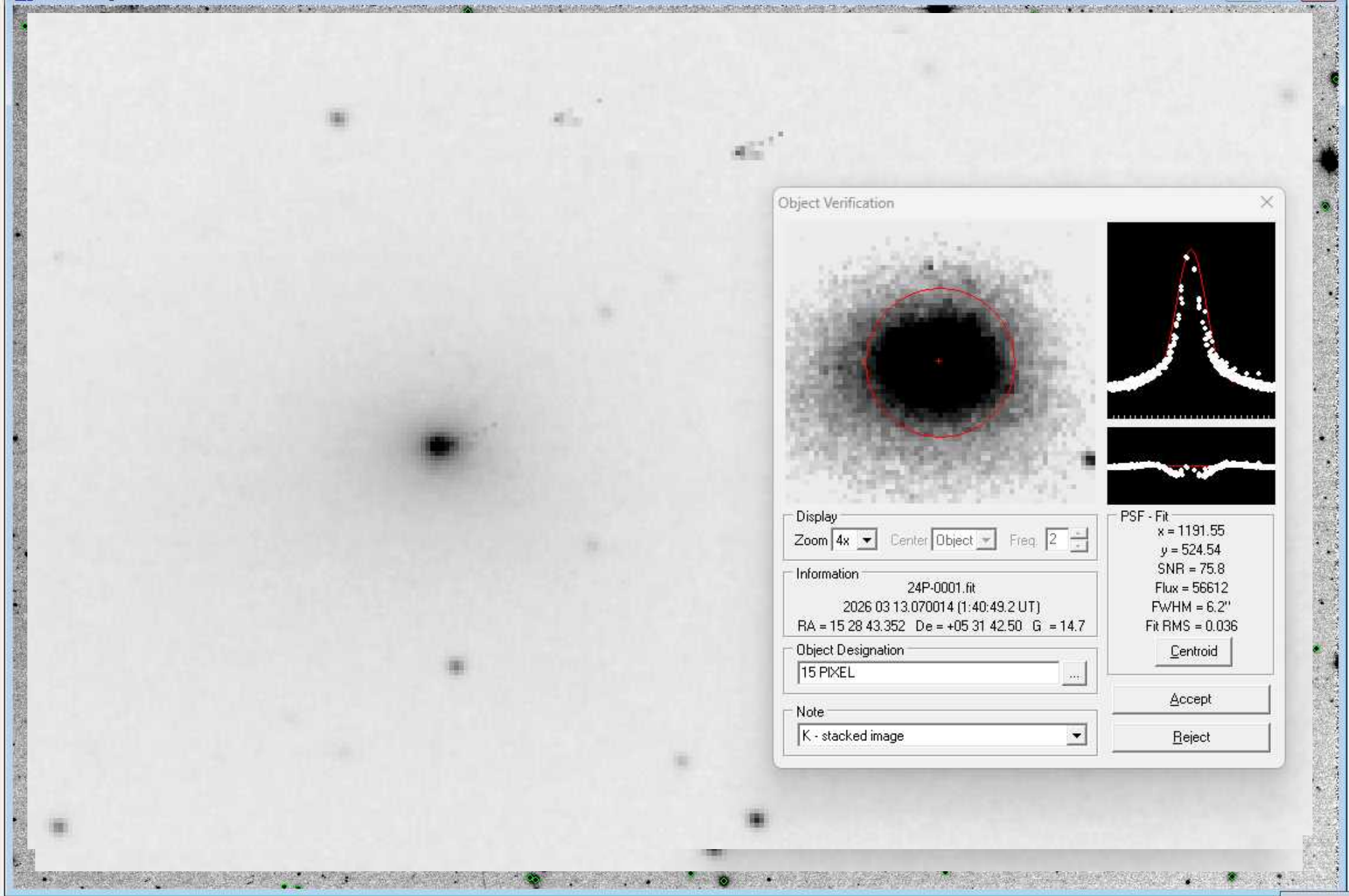


Image - 24P-0016.fit [50%]

Stacked Image - 24P-0001.fit + 14 [50%]



Object Verification

Display

Zoom 4x Center Object Freq. 2

Information

24P-0001.fit

2026 03 13.070014 (1:40:49.2 UT)

RA = 15 28 43.352 De = +05 31 42.50 G = 14.7

Object Designation

15 PIXEL ...

Note

K - stacked image

PSF - Fit

x = 1191.55

y = 524.54

SNR = 75.8

Flux = 56612

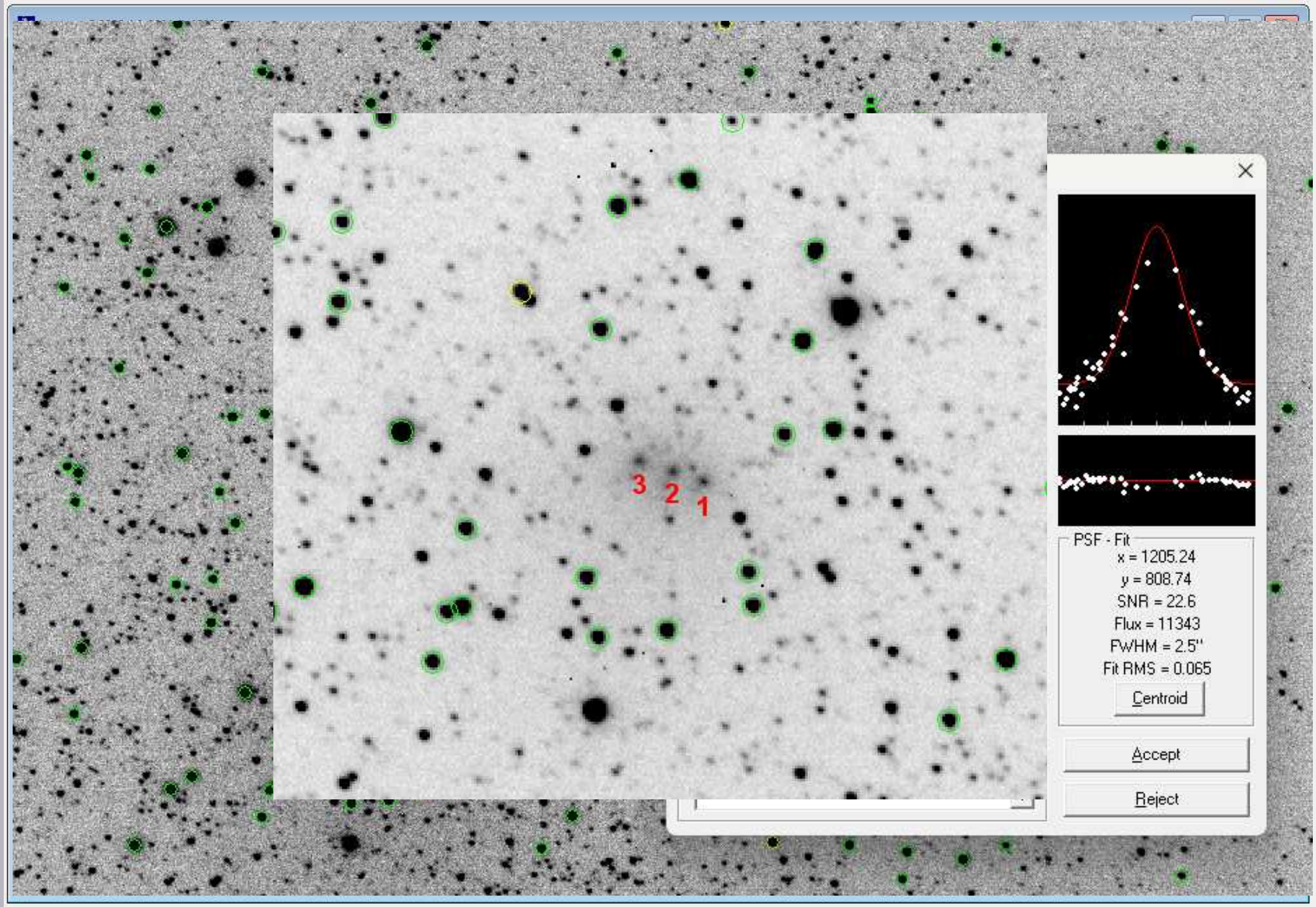
FWHM = 6.2"

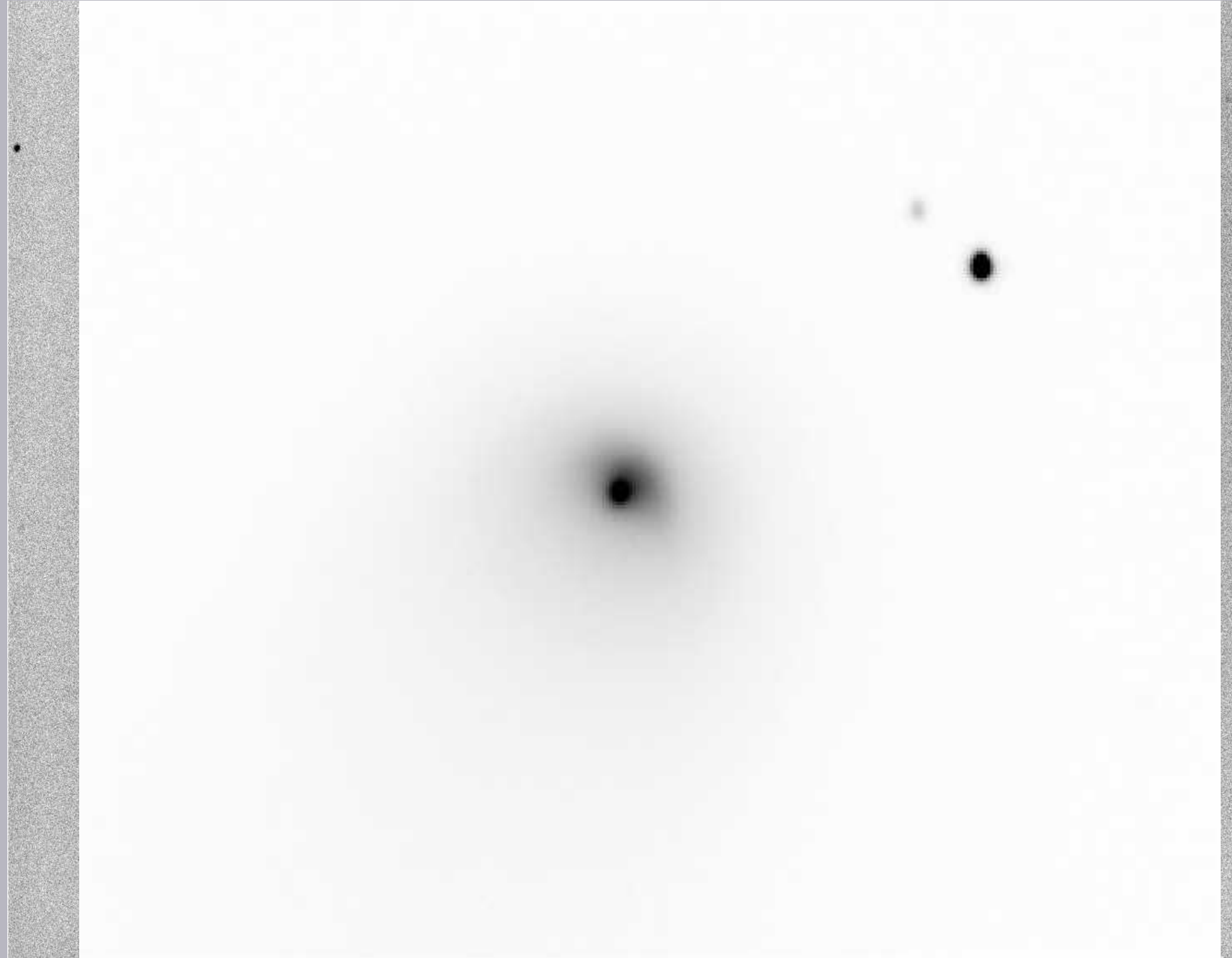
Fit RMS = 0.036

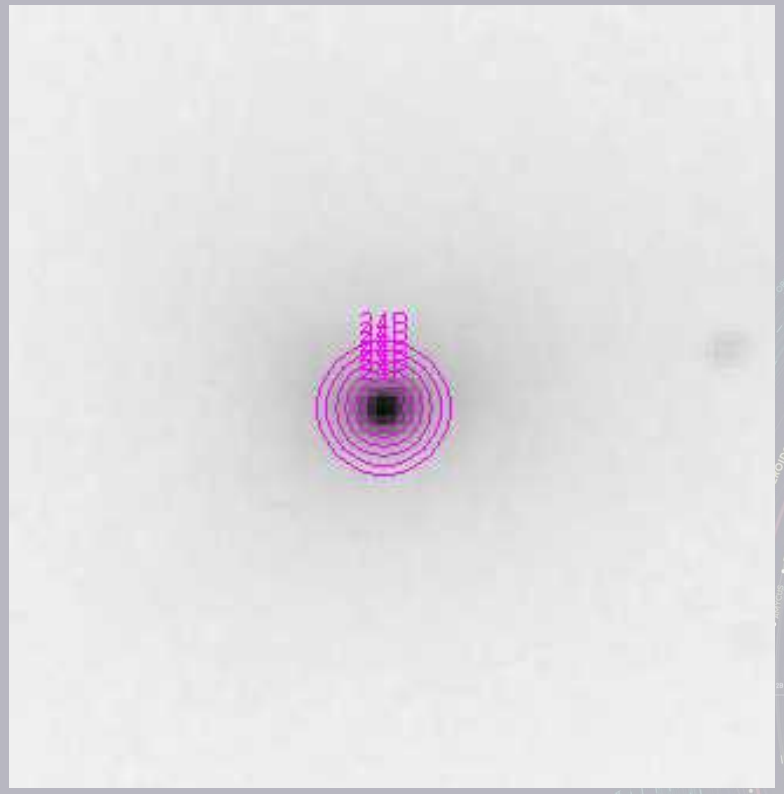
Centroid

Accept

Reject


3
2
1
PSF - Fit
x = 1205.24
y = 808.74
SNR = 22.6
Flux = 11343
FWHM = 2.5''
Fit RMS = 0.065
Centroid
Accept
Reject





FIND_ORB Orbit Determination Software

Open... | P/24

Perturbers: Mercu Mars Uranu / Venus Jupite Neptu / Earth Saturn Pluto / Moon Asteroids / All Perturbers Off

Epoch 2026 Feb 26 | R1: 2.0385 AU | R2: 0.6425 AU

About... | Herget step | Full step | Vaisala | Auto-Solve | Save Residuals.. | Save elements | Ephemeris... | Settings | Monte Carlo... | Stat Ranging | Simplex | Gauss | Worst obs | Filter obs | Toggle Obs | Set Sigma(s) | Exit

Orbital elements: P/24

Perihelion 2026 Jan 8.340063 +/- 2.59e-5 TT = 8:09:41 (JD 2461048.840063)
Epoch 2026 Feb 26.0 TT = JDT 2461097.5 Earth MOID: 0.2627 Ju: 0.4651
M 5.86743770 +/- 0.00007 Ma: 0.0421 Find_Orb
n 0.12058046 +/- 1.56e-6 Peri. 58.48256 +/- 0.000034
a 4.05774501 +/- 3.5e-5 Node 78.27009 +/- 0.000044
e 0.7082255 +/- 2.42e-6 Incl. 11.50212 +/- 0.000014
P 8.17 M(N) 15.5 K 10.0 U 3.8
q 1.18394643 +/- 3.86e-7 Q 6.93154360 +/- 6.95e-5
From 804 observations 2025 Aug. 24-2026 Feb. 26; mean residual 0".56

2601 08.092966	M22	13 19 28.375	+12 59 39.19	.11-	.53+
2601 08.097125	M22	13 19 29.364	+12 59 36.20	.16-	.48+
2601 09.634588	T05	13 25 38.402	+12 41 05.46	.19-	.09+
2601 09.636062	T05	13 25 38.753	+12 41 04.78	.05-	.45+
2601 09.636517	T05	13 25 38.851	+12 41 03.70	.16-	.31-
2601 09.637892	T05	13 25 39.175	+12 41 03.48	.09-	.44+
2601 09.641424	T05	13 25 39.986	+12 41 01.28	.20-	.73+
2601 09.642340	T05	13 25 40.205	+12 41 00.31	.10-	.40+
2601 09.667676	T05	13 25 46.056	+12 40 42.56	.32-	.55+
2601 09.668584	T05	13 25 46.282	+12 40 41.81	.09-	.44+
2601 10.190463	213	13 27 49.754	+12 34 26.54	.16-	.55+
2601 10.222951	213	13 27 57.254	+12 34 03.65	.11-	.52+
2601 10.255069	213	13 28 04.658	+12 33 40.90	.08-	.46+
2601 10.824410	323	13 30 18.470	+12 27 15.55	.68-	.30+
2601 10.830486	323	13 30 19.891	+12 27 11.63	.23-	.60+
2601 11.081179	M22	13 31 18.262	+12 24 14.90	.08-	.37+
2601 11.099663	M22	13 31 22.478	+12 24 02.09	.04-	.36+
2601 11.101468	M22	13 31 22.889	+12 24 00.68	.04-	.20+
2601 11.108714	M22	13 31 24.535	+12 23 55.82	.09-	.37+
2601 12.08334	A71	13 35 08.93	+12 12 14.6	.21-	.47+
2601 12.09119	A71	13 35 10.69	+12 12 09.1	.36-	.37+
2601 12.09904	A71	13 35 12.47	+12 12 03.8	.19-	.47+
2601 12.190185	213	13 35 33.101	+12 11 02.33	.23-	.63+
2601 12.223368	213	13 35 40.512	+12 10 39.40	.26-	.66+
2601 12.256192	213	13 35 47.844	+12 10 16.54	.13-	.60+
2602 26.140091	204	15 21 50.727	+06 21 23.63	.07+	.34-
2602 26.142075	204	15 21 50.819	+06 21 23.23	.09-	.26-
2602 26.144049	204	15 21 50.914	+06 21 22.71	.20-	.32-

Click on an observation to get information about it. Right-click to get further options. Ctrl-click to select multiple observations.
Version Mar 17 2019
No JPL DE ephemeris file loaded; using (slower) PS1996 series
See https://www.projectpluto.com/find_orb.htm#de_eph for info on how/why to use JPL DE ephemerides

Astrometria tradizionale

FIND_ORB Orbit Determination Software

Open... | P/24

Perturbers: Mercu Mars Uranu / Venus Jupite Neptu / Earth Saturn Pluto / Moon Asteroids / All Perturbers Off

Epoch 2026 Feb 26 | R1: 2.0385 AU | R2: 0.6425 AU

About... | Herget step | Full step | Vaisala | Auto-Solve | Save Residuals.. | Save elements | Ephemeris... | Settings | Monte Carlo... | Stat Ranging | Simplex | Gauss | Worst obs | Filter obs | Toggle Obs | Set Sigma(s) | Exit

Orbital elements: P/24

Perihelion 2026 Jan 8.340067 +/- 3.65e-5 TT = 8:09:41 (JD 2461048.840067)
Epoch 2026 Feb 26.0 TT = JDT 2461097.5 Earth MOID: 0.2627 Ju: 0.4651
M 5.86750079 +/- 0.00007 Ma: 0.0421 Find_Orb
n 0.12058176 +/- 1.67e-6 Peri. 58.48248 +/- 0.000042
a 4.05771568 +/- 3.74e-5 Node 78.27015 +/- 0.000045
e 0.7082234 +/- 2.58e-6 Incl. 11.50214 +/- 0.000014
P 8.17 M(N) 15.5 K 10.0 U 3.8
q 1.18394629 +/- 4.37e-7 Q 6.93148506 +/- 7.43e-5
From 804 observations 2025 Aug. 24-2026 Feb. 26; mean residual 0".55

2601 08.092966	M22	13 19 28.375	+12 59 39.19	.11-	.36+
2601 08.097125	M22	13 19 29.364	+12 59 36.20	.16-	.31+
2601 09.634588	T05	13 25 38.402	+12 41 05.46	.20-	.08-
2601 09.636062	T05	13 25 38.753	+12 41 04.78	.06-	.28+
2601 09.636517	T05	13 25 38.851	+12 41 03.70	.17-	.48-
2601 09.637892	T05	13 25 39.175	+12 41 03.48	.09-	.26+
2601 09.641424	T05	13 25 39.986	+12 41 01.28	.20-	.55+
2601 09.642340	T05	13 25 40.205	+12 41 00.31	.10-	.23+
2601 09.667676	T05	13 25 46.056	+12 40 42.56	.32-	.38+
2601 09.668584	T05	13 25 46.282	+12 40 41.81	.09-	.27+
2601 10.190463	213	13 27 49.754	+12 34 26.54	.17-	.37+
2601 10.222951	213	13 27 57.254	+12 34 03.65	.12-	.34+
2601 10.255069	213	13 28 04.658	+12 33 40.90	.09-	.29+
2601 10.824410	323	13 30 18.470	+12 27 15.55	.68-	.13+
2601 10.830486	323	13 30 19.891	+12 27 11.63	.24-	.42+
2601 11.081179	M22	13 31 18.262	+12 24 14.90	.09-	.19+
2601 11.099663	M22	13 31 22.478	+12 24 02.09	.05-	.18+
2601 11.101468	M22	13 31 22.889	+12 24 00.68	.05-	.02+
2601 11.108714	M22	13 31 24.535	+12 23 55.82	.09-	.19+
2601 12.08334	A71	13 35 08.93	+12 12 14.6	.22-	.29+
2601 12.09119	A71	13 35 10.69	+12 12 09.1	.37-	.19+
2601 12.09904	A71	13 35 12.47	+12 12 03.8	.20-	.29+
2601 12.190185	213	13 35 33.101	+12 11 02.33	.24-	.45+
2601 12.223368	213	13 35 40.512	+12 10 39.40	.27-	.48+
2601 12.256192	213	13 35 47.844	+12 10 16.54	.14-	.42+
2602 26.140091	204	15 21 50.725	+06 21 23.64	.00	.64-
2602 26.142075	204	15 21 50.819	+06 21 23.24	.15-	.57-
2602 26.144049	204	15 21 50.915	+06 21 22.72	.23-	.62-

Click on an observation to get information about it. Right-click to get further options. Ctrl-click to select multiple observations.
Version Mar 17 2019
No JPL DE ephemeris file loaded; using (slower) PS1996 series
See https://www.projectpluto.com/find_orb.htm#de_eph for info on how/why to use JPL DE ephemerides

Zero aperture astrometry