2025FA22 Made in Italy

Relatore Paolo Bacci backman

GAMP *Gruppo Astrofili Montagna Pistoiese*

Asteroide 2025 FA22 PHA Apollo

Scoperto il:

- M.P.E.C. 2025-G41 2025 April 3, 05:56 UT
  - F52 Pan-STARRS 2, **2025.03.29** 21.5 mag
- M.P.E.C. 2025-O76 2025 July 24, 14:19 UT
  - F51 Pan-STARRS 1, 2012 02.26 22.5 mag.

Diametro stimato 160 mt

Keplerian elements

(Epoch 61200.0 MJD)

	Value	1-σ variation	Units
a	1.49583	6.61e-09	au
e	0.411381	8.47e-09	
i	7.622	1.885e-06	deg
Ω	356.451	6.527e-07	deg
ω	304.376	2.278e-06	deg
M	164.856	1.149e-06	deg

More info »

Other useful info

Absolute Magnitude (H)	21.6	mag
Slope parameter (G)	0.15	mag
Perihelion distance	0.8805	au
Aphelion distance	2.1112	au
Asc. node-Earth separation	0.00331	au
Desc. node-Earth separation	0.62406	au
Earth MOID	0.00137	au
Orbital period	668.224	days
Date of orbit computation	Mar 11 12:42	

Observational summary

Optical observations (Discarded)	3326 (18)	
Radar observations (Discarded)	2 (1)	
Arc length		days
Unobserved		days

More info »

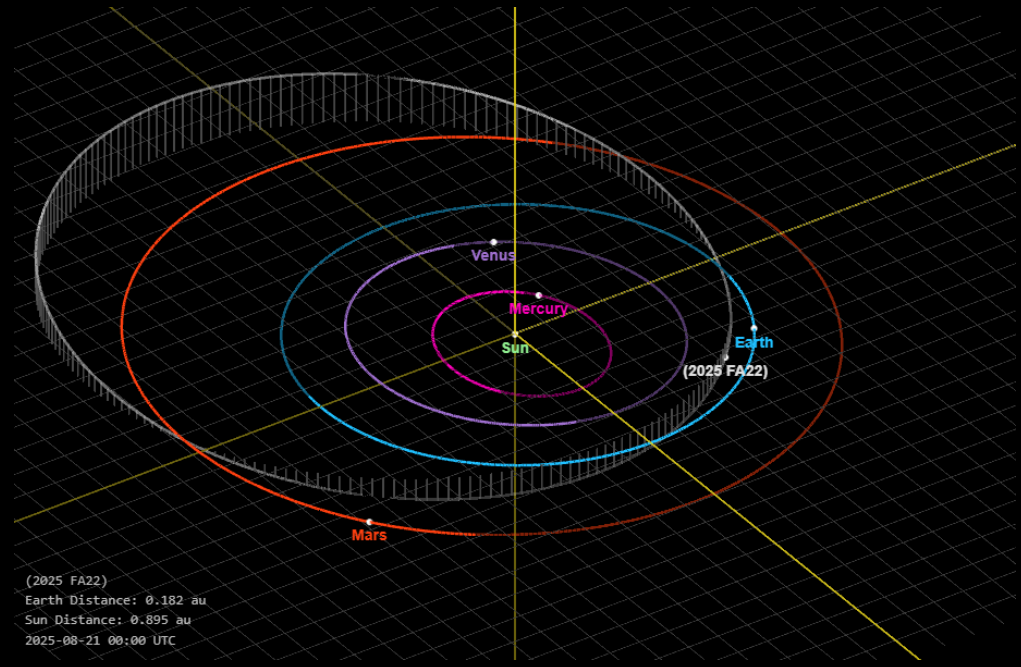
Ephemeris

(Epoch MJD)

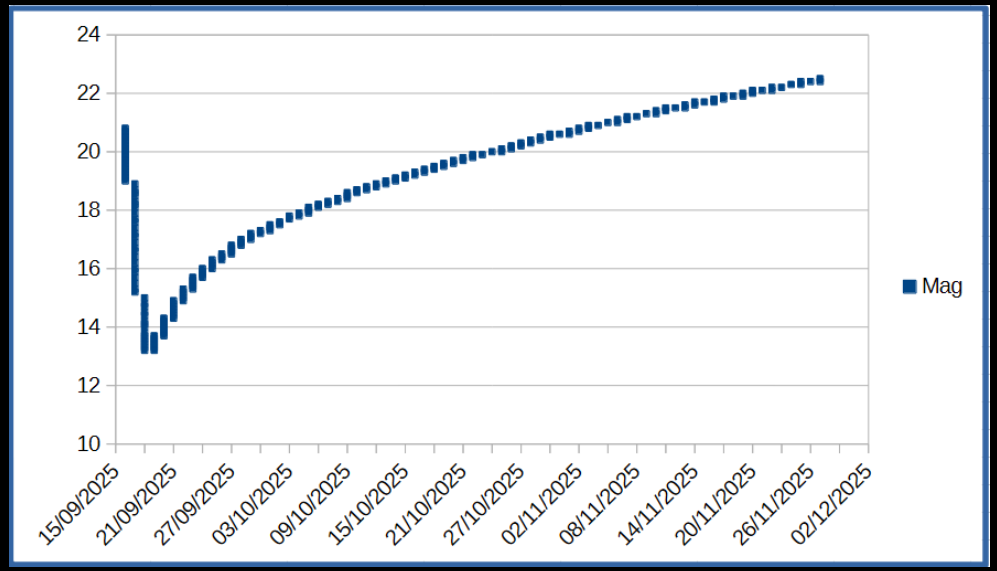
Right Ascension		deg
Declination		deg
V Magnitude		mag
Solar Elongation		deg
Galactic Latitude		deg
Rate		deg/day
Direction		deg

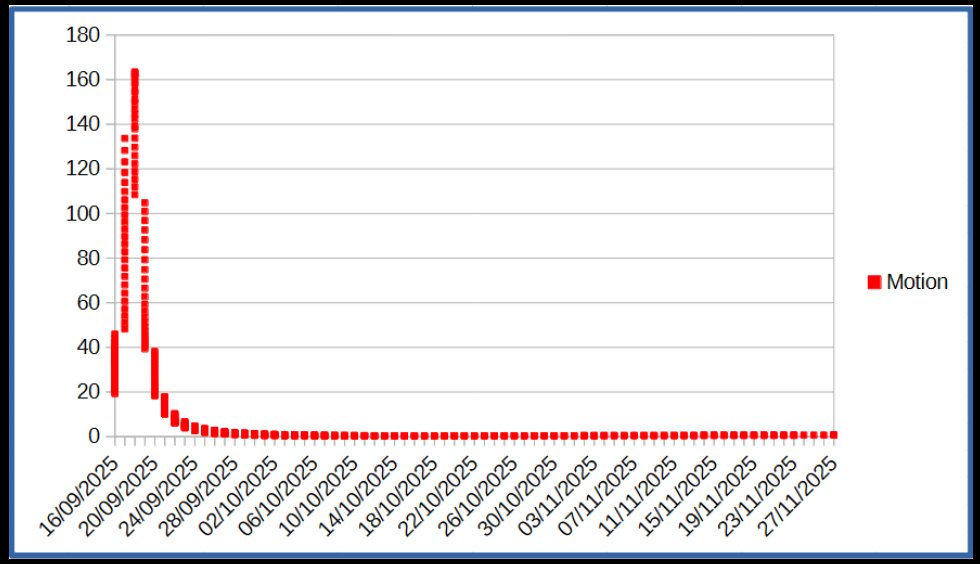
2025 FA22 CLOSE APPROACHES → 18.09.2025 0.0056 UA (2.19 LD)

From 1950 to 2150							
Planet	Date	MJD	Nominal distance (au)	Min. possible distance (au)	Stretching (au)	Width (au)	Close app. probability
EARTH	1951/09/19.75615	33908.8	0.0096824	0.0096823	6.246e-7	1.663e-9	1.00e+0
EARTH	1964/06/09.92078	38555.9	0.1502750	0.1502750	5.847e-8	3.061e-8	1.00e+0
EARTH	1975/10/02.00541	42687.0	0.1726570	0.1726570	3.229e-7	1.686e-9	1.00e+0
EARTH	1988/09/03.82920	47407.8	0.0898541	0.0898540	4.870e-7	5.040e-9	1.00e+0
EARTH	2001/06/18.78477	52078.8	0.1600490	0.1600490	2.613e-7	3.081e-8	1.00e+0
EARTH	2014/05/13.13684	56790.1	0.1850070	0.1850070	2.384e-7	2.967e-8	1.00e+0
EARTH	2025/09/18.32076	60936.3	0.0056288	0.0056288	2.405e-9	1.442e-9	1.00e+0
EARTH	2036/08/20.15415	64925.2	0.1340540	0.1340540	2.690e-7	8.121e-9	1.00e+0
EARTH	2047/07/11.57632	68902.6	0.1747930	0.1747920	2.690e-7	2.114e-8	1.00e+0
EARTH	2058/05/27.00594	72875.0	0.1284920	0.1284910	1.087e-6	2.833e-8	1.00e+0
EARTH	2069/05/12.02855	76878.0	0.1889350	0.1889350	1.701e-6	2.805e-8	1.00e+0
MARS	2083/09/13.36208	82115.4	0.0373082	0.0373078	1.487e-6	7.890e-9	1.00e+0
EARTH	2089/09/23.10853	84317.1	0.0403428	0.0403416	2.122e-6	1.392e-9	1.00e+0
EARTH	2100/09/17.94797	88328.9	0.0189101	0.0189069	4.415e-6	1.435e-9	1.00e+0
EARTH	2111/07/16.50701	92282.5	0.1748280	0.1748170	1.492e-5	1.775e-8	1.00e+0
EARTH	2122/05/18.39630	96241.4	0.1429100	0.1428820	9.583e-5	2.826e-8	1.00e+0
EARTH	2131/10/04.94387	99667.9	0.1872680	0.1871770	1.373e-4	2.024e-9	1.00e+0
EARTH	2142/09/05.61853	103657.0	0.0926586	0.0926269	1.272e-4	4.681e-9	1.00e+0

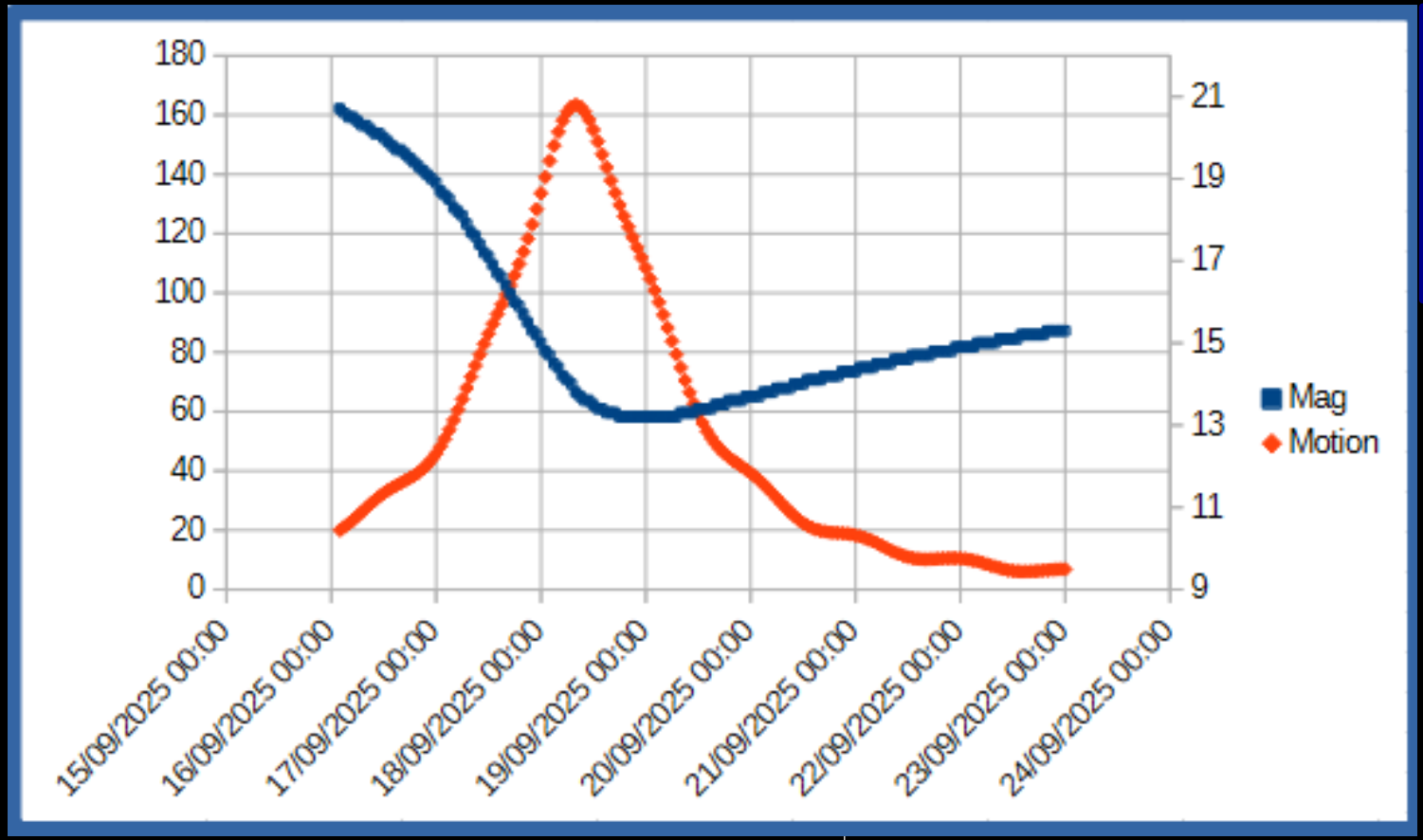


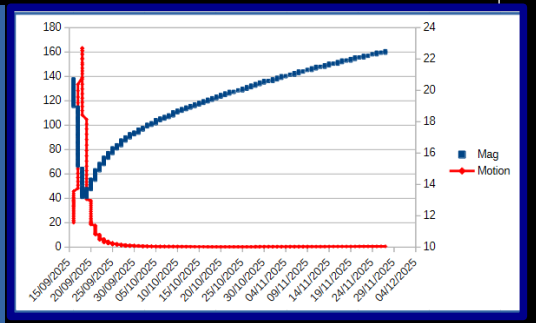
2025 FA22 Magnitudine e Motion





2025 FA22 Magnitudine e Motion





IAWN

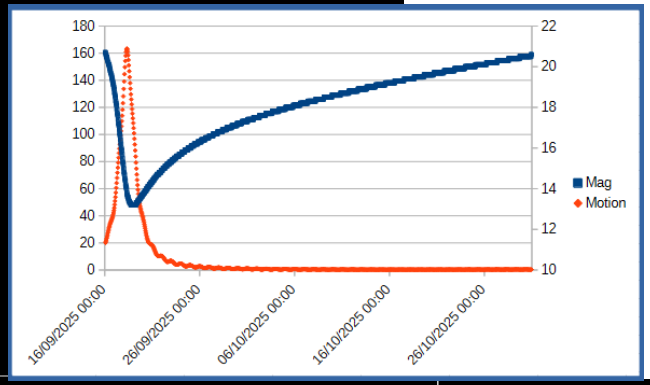
International Asteroid Warning Network

Campagna 16/09/2025 – 30/10/2025

Mag: 20.7 – (13.2) - 20.5

- **Astrometria**
- **Fotometria (formato ADES !!!)**
- **Spettrografia**
- **Radar**
- **Polarimetria**
- **Modello**

17/09/2025
Comunicazione sulla mailing list ASTEROIDI



2025 FA22 IAWN Campaign

Campaign Home page
Obs. Planning Tables
Orbit
Observing Geometry
Gallery
Campaign Summary

RELATED LINKS
International Asteroid Warning Network
Planetary Defense Coordination Office
NASA PDS: Small Bodies Node
Minor Planet Center (MPC)
Center for Near Earth Object Studies

Introduction

2025 FA22 will make a close approach on September 18, 2025, UTC at a distance of 2 lunar distances. This close approach prsents a perfect opportunity for an IAWN campaign.

The goal of the 2025 FA22 campaign is to exercise our capability to collect position and physical characterization data on this former virtual impactor. For the purpose of the exercise, we will treat this object as a current virtual impactor with a Torino Scale >= 1 with a hypothetical impact on September 19, 2089.

The campaign will start with the optical 'recovery' around September 17, 2025, when the object is between 40-60 deg. Solar elongation. The orbital improvement from recovery data is meant to facilitate rapid characterization of the target.

2025 FA22 Campaign Team & Working Group Leads

- **NASA HQ POC:** Dr. Kelly Fast
- **IAWN Campaign Coordinator:** Dr. Vishnu Reddy (University of Arizona)
- **Astrometry WG Lead:** Dr. Davide Farnocchia (JPL CNEOS)
- **Photometry WG Lead:** Dr. Adam Battle (University of Arizona)
- **Spectroscopy WG Lead:** Dr. Cristina Thomas (Northern Arizona University)
- **Radar WG Lead:** Dr. Shantanu Naidu (JPL CNEOS)
- **Polarimetry WG Lead:** Dr. Maxime Devogele (ESA NEOCC)
- **Hazard Modeling:** Dr. Jessie Dotson (NASA Ames)
- **IAWN Campaign Communications:** Elizabeth Warner

2025 FA22 Campaign – Important Dates

- *Campaign Kick Off Telecon:* Aug. 22, 2025, 15:00 UTC
- *Second Telecon:* September 15, 2025, 15:00 UTC (for Q&A, optional)
- **Campaign Start:** September 16, 2025
- *Mid-Campaign Check-in Telecon:* October 14, 2025, 15:00 UTC
- **Campaign End:** October 30, 2025
- *Close-out Telecon:* November 6, 2025, 15:00 UTC

Working Group Guidelines

Clicking on these files will open them in the browser (good to take a look first). To download files, right-click-save-link-as.

- Photometry -- Adam Battle
  - IAWN-Photometry-Guidelines-2025-update.pdf (updated 15 Sep 2025 after Q&A discussion)
  - 20250929UTC_ADES-Example_2025FA22_0004_Sr.psv (revised 23 Sept, AB)
  - 20250929UTC_Min-Requirement-Example_2025FA22_0004_Sr.txt (revised 23 Sept, AB)

Campagna Astrometrica

- Osservatori partecipanti: 131
- Misure astrometriche totali: 3295

Tabella riassuntiva per ogni codice osservatorio vengono indicate le misure inviate al MPC, Percentuale su tutte le misure per ciascun osservatorio

		131	3295
Cod	Misure	Perc	%somma
L92	456	13,84%	13,84%
583	230	6,98%	20,82%
69	178	5,40%	26,22%
I40	161	4,89%	31,11%
C40	159	4,83%	35,93%
270	123	3,73%	39,67%
Z01	109	3,31%	42,97%
N42	101	3,07%	46,04%
L76	98	2,97%	49,01%
89	72	2,19%	51,20%
G34	70	2,12%	53,32%
W63	51	1,55%	54,87%
J13	45	1,37%	56,24%
M32	43	1,31%	57,54%
168	40	1,21%	58,76%
T05	40	1,21%	59,97%
718	39	1,18%	61,15%
160	38	1,15%	62,31%
I41	38	1,15%	63,46%
L99	38	1,15%	64,61%
F51	37	1,12%	65,74%
L54	35	1,06%	66,80%
246	33	1,00%	67,80%
K74	33	1,00%	68,80%
703	32	0,97%	69,77%
X08	32	0,97%	70,74%
291	31	0,94%	71,68%
M47	30	0,91%	72,59%
C23	28	0,85%	73,44%
104	27	0,82%	74,26%
585	26	0,79%	75,05%
M19	25	0,76%	75,81%
932	24	0,73%	76,54%
F52	24	0,73%	77,27%
L90	22	0,67%	77,94%
203	21	0,64%	78,57%

Campagna Astrometrica ITALIA

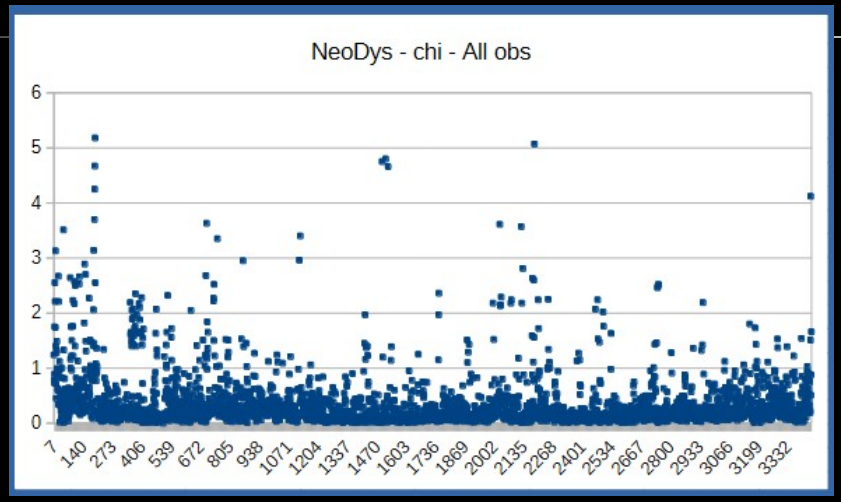
- Osservatori partecipanti: 21
- Misure astrometriche totali: 687

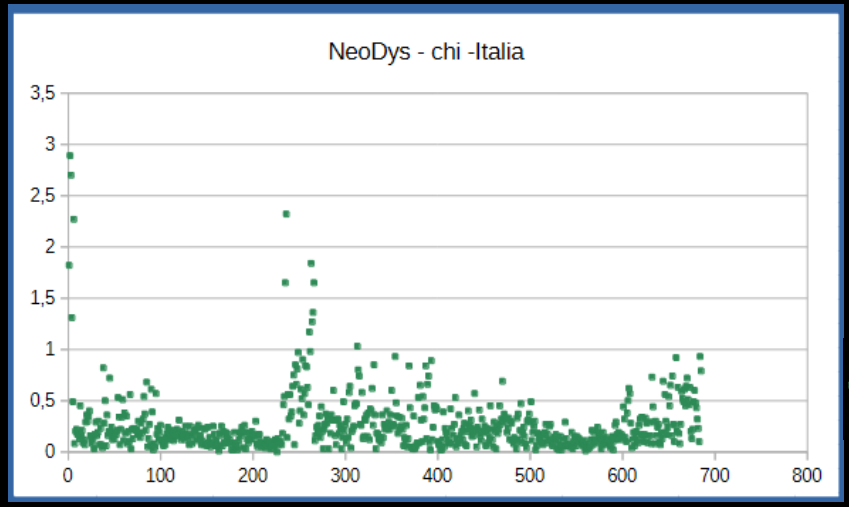
Tabella riassuntiva per ogni codice osservatorio quante misure ha inviato al MPC, Percentuale su tutte le misure per ciascun osservatorio

21	687		
Cod	Misure	Perc	%Somma
L92	456	66,38%	66,38%
160	38	5,53%	71,91%
104	27	3,93%	75,84%
L90	22	3,20%	79,04%
203	21	3,06%	82,10%
C82	20	2,91%	85,01%
L34	19	2,77%	87,77%
598	12	1,75%	89,52%
M26	12	1,75%	91,27%
K78	10	1,46%	92,72%
M57	8	1,16%	93,89%
126	6	0,87%	94,76%
G17	6	0,87%	95,63%
L73	6	0,87%	96,51%
D43	5	0,73%	97,23%
D63	5	0,73%	97,96%
595	3	0,44%	98,40%
D98	3	0,44%	98,84%
K83	3	0,44%	99,27%
M60	3	0,44%	99,71%
M50	2	0,29%	100,00%

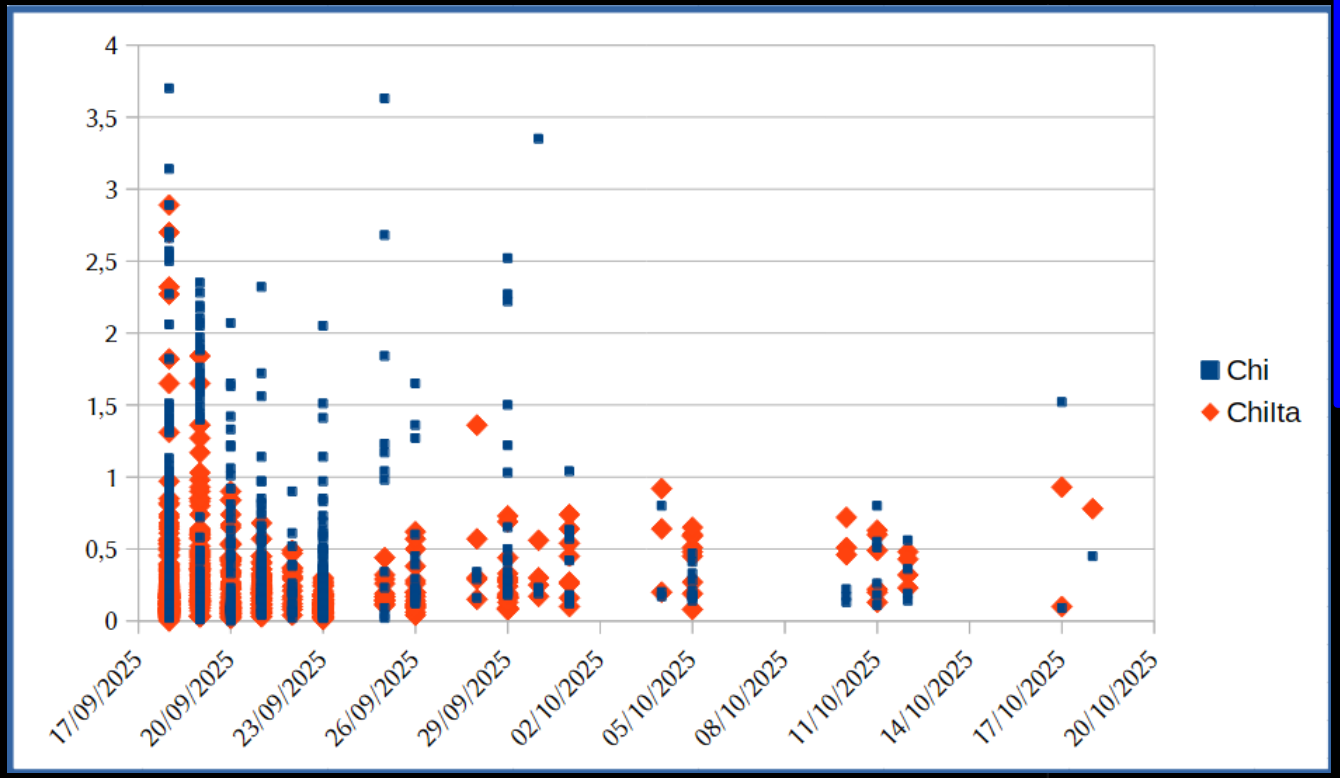
Astrometria NeoDys ***chi***

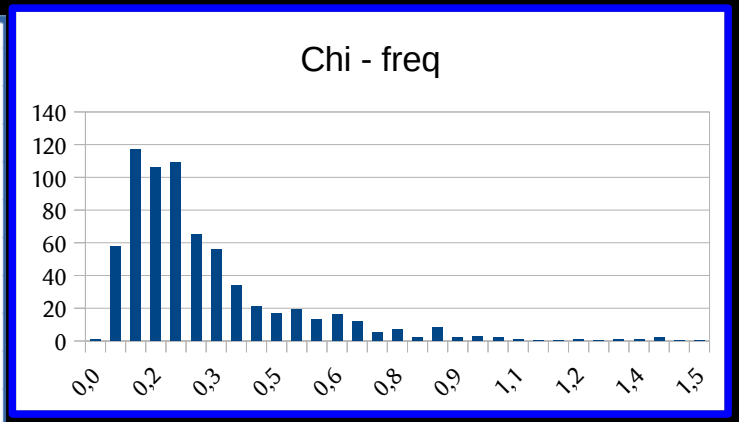
- Dal sito NeoDys-2 sono state estrapolate tutte le misure astrometriche di 2025 FA22.
- Si grafica il Valore *chi* che indica la bontà dell'osservazione, in genere un valore superiore a **2.8** non viene utilizzato per la determinazione dell'orbita dell'asteroide.



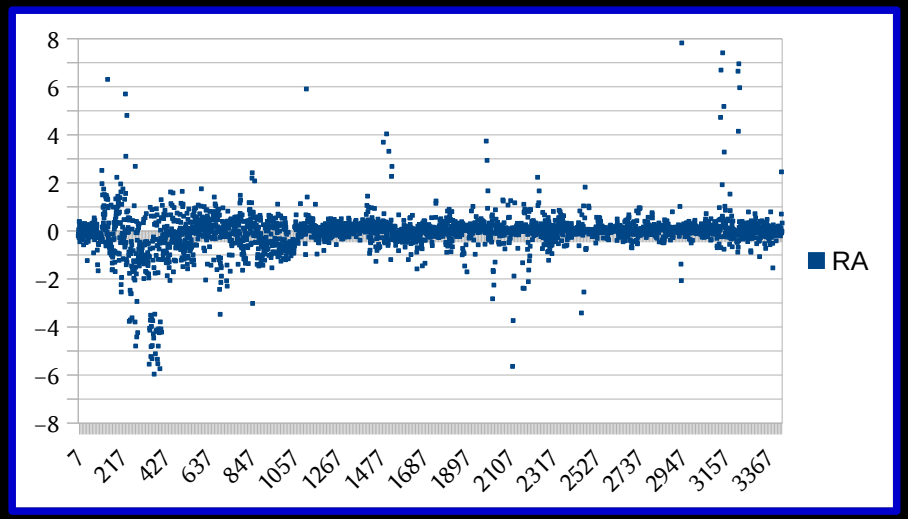


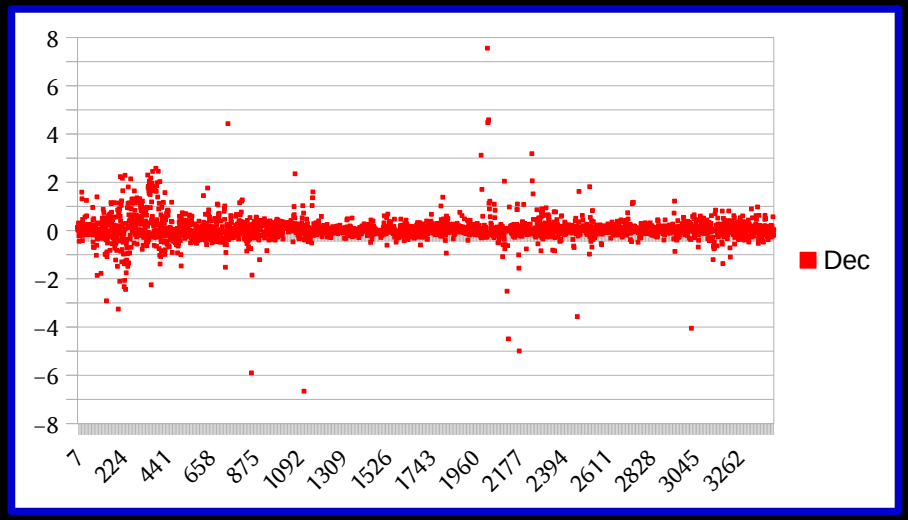
Astrometria NeoDys ***chi***

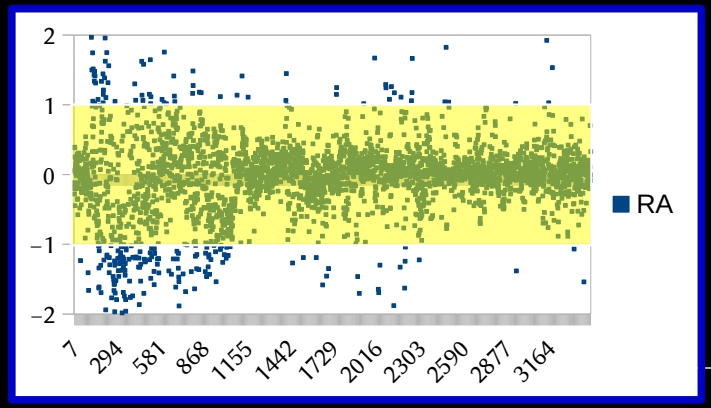


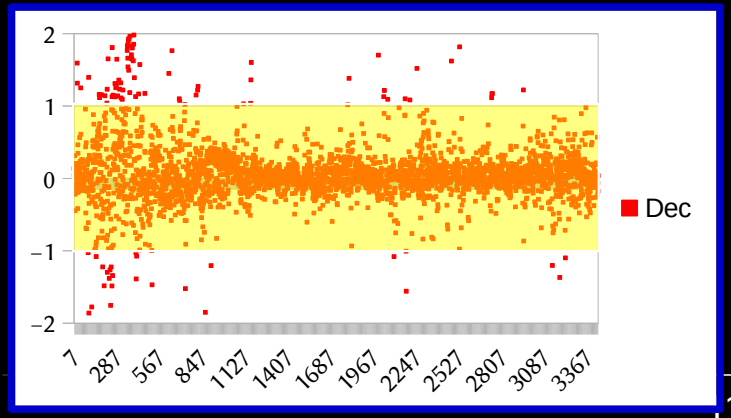


Astrometria NeoDys **RA Dec**

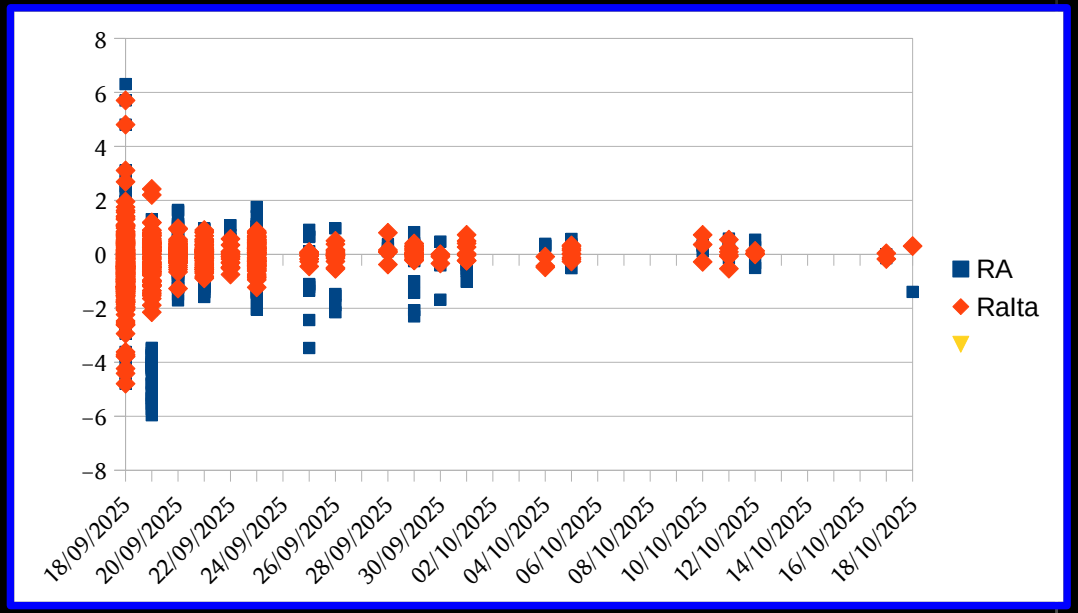


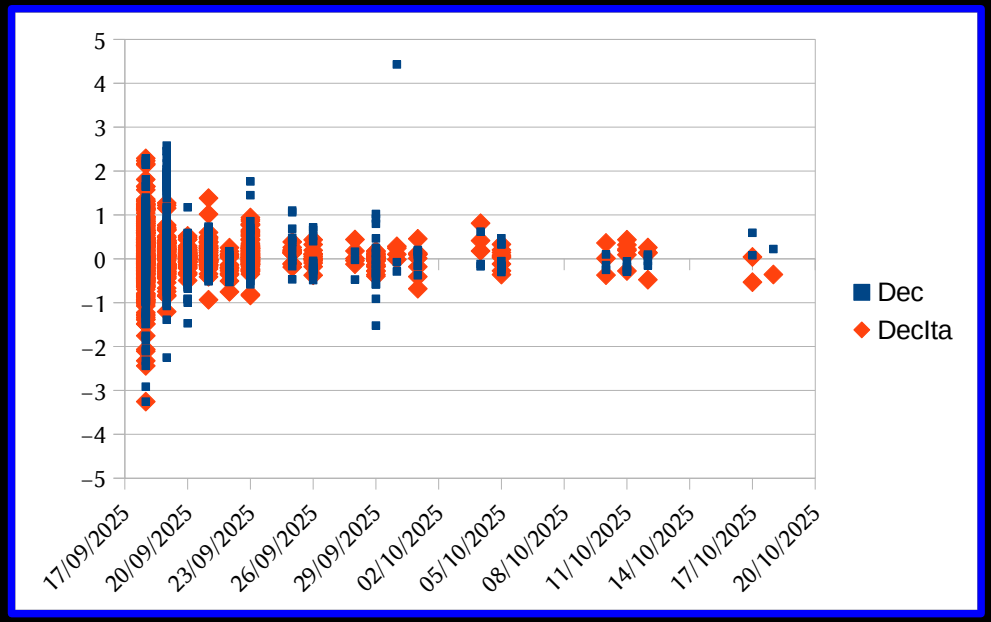




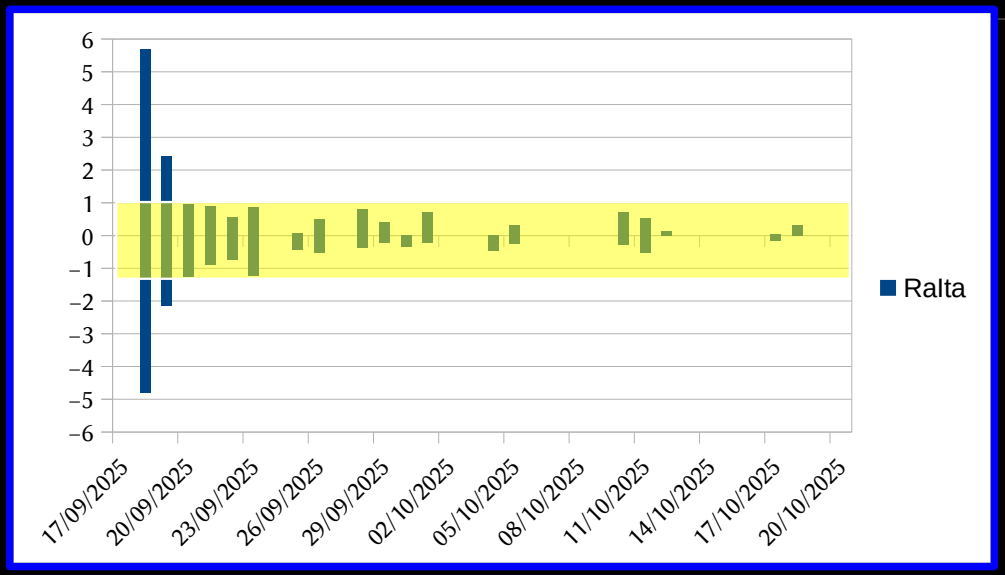


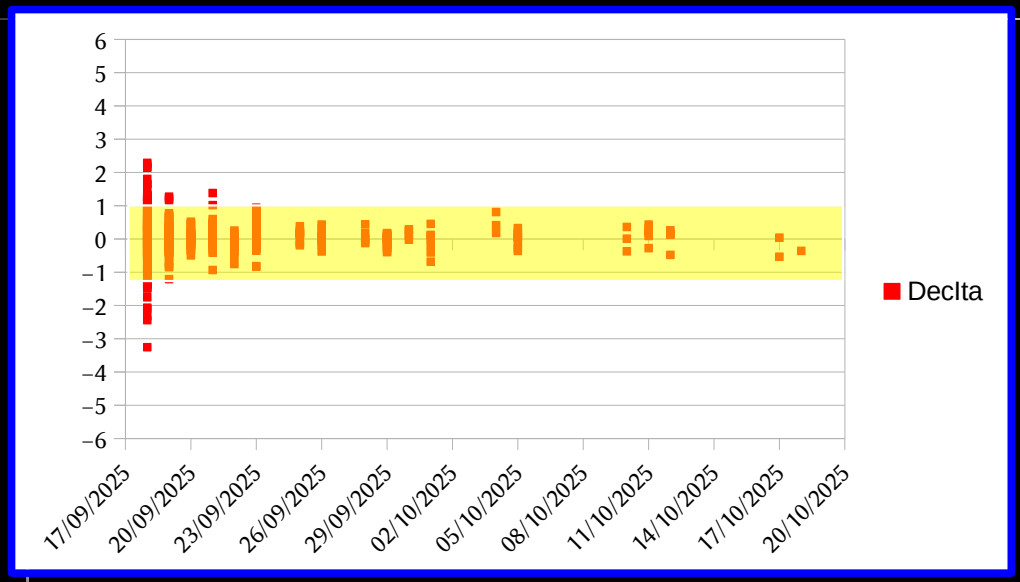
Astrometria NeoDys **RA Dec**

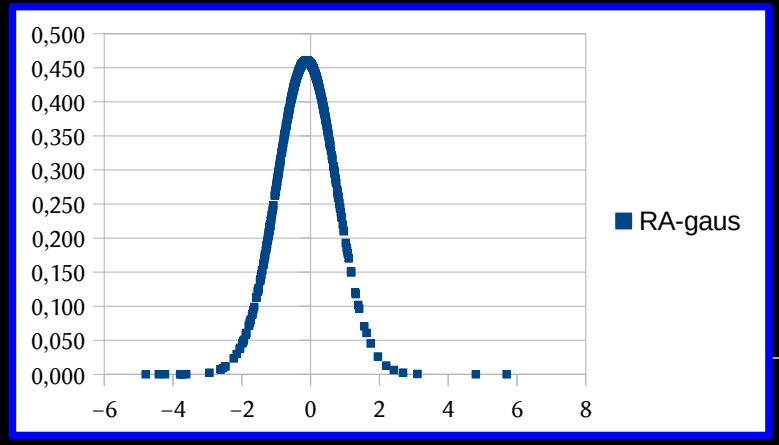


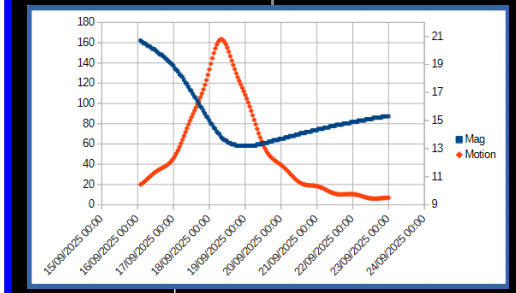


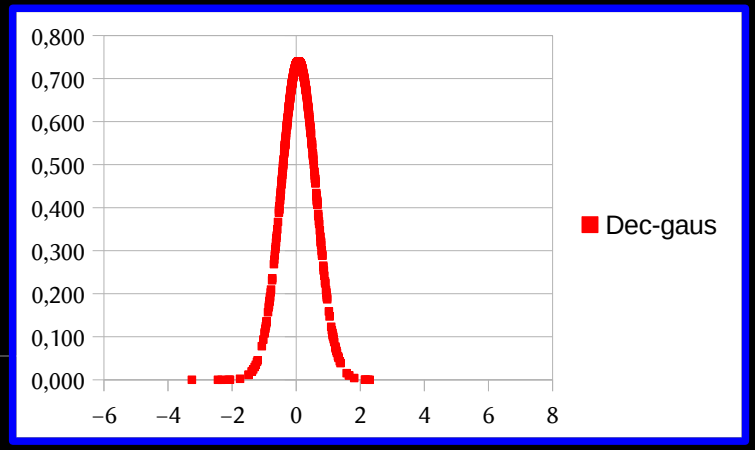
Astrometria Neodys **RA Dec** ITALIA



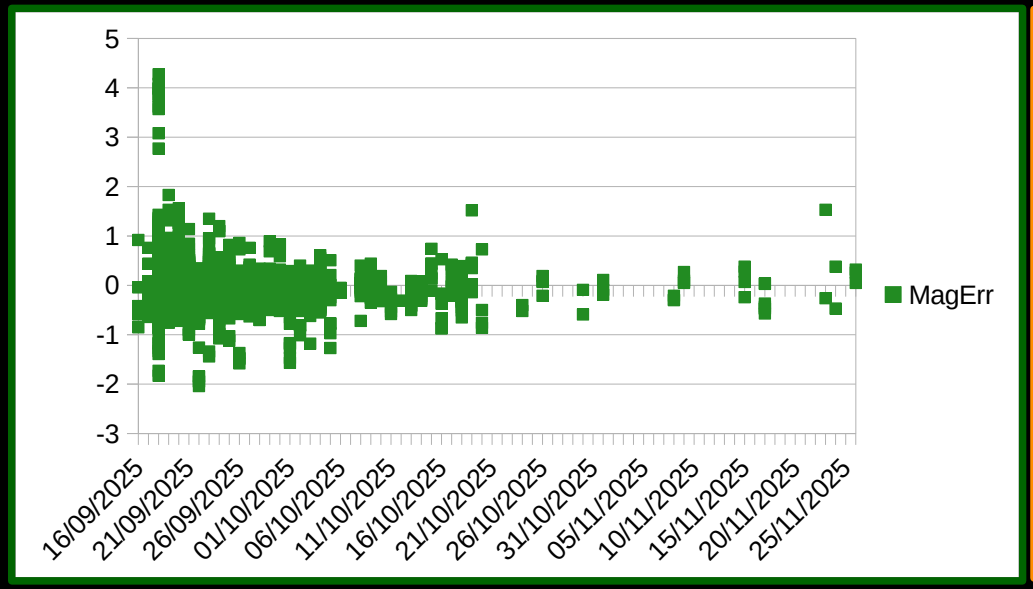


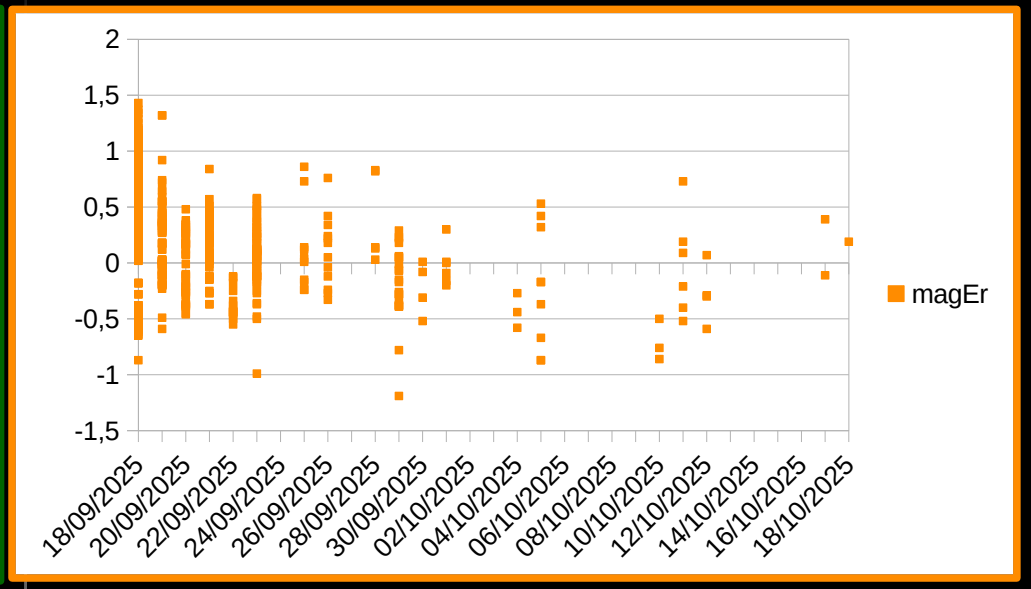






Astrometria Neodys magnitudine





Astrometria NeoDys **RA Dec ITALIA**

Tabella

- Codice Obs
- Mediana RA
- Mediana Dec
- Mediana chi
- Medina ErrMag
- Misure inviate
- % misure ITA
- % misure ALL

Cod	RA	Dec	Chi	MagErr	Misure	M%	Mall%
104	0,04	0,05	0,51	−0,14	27	3,93%	0,82%
126	−0,63	0,24	0,55	0,14	6	0,87%	0,18%
160	−0,06	0,02	0,11	−0,37	38	5,53%	1,15%
203	0,23	−0,19	0,41	0,19	21	3,06%	0,64%
595	0,17	0,18	0,25	−0,22	3	0,44%	0,09%
598	−0,05	0,02	0,17	−0,05	12	1,75%	0,36%
C82	−0,26	0,20	0,29	0,02	20	2,91%	0,61%
D43	0,44	−0,12	0,46	0,52	5	0,73%	0,15%
D63	0,16	−0,03	0,45	0,35	5	0,73%	0,15%
D98	0,26	−0,25	0,36	1,32	3	0,44%	0,09%
G17	0,08	0,17	0,44	0,02	6	0,87%	0,18%
K78	−0,04	0,21	0,21	−0,24	10	1,46%	0,30%
K83	0,24	0,07	0,25	0,33	3	0,44%	0,09%
L34	0,08	0,00	0,30	−0,08	19	2,77%	0,58%
L73	−1,50	0,59	1,32	−0,20	6	0,87%	0,18%
L90	0,02	0,12	0,17	−0,14	22	3,20%	0,67%
L92	−0,34	0,08	0,16	0,24	456	66,38%	13,84%
M26	0,10	−0,09	0,34	−0,07	12	1,75%	0,36%
M50	−0,18	0,02	0,46	−0,54	2	0,29%	0,06%
M57	0,77	−0,28	1,38	0,39	8	1,16%	0,24%
M60	0,39	0,08	0,65	−0,29	3	0,44%	0,09%
Totale	**−0,12**	**0,07**	**0,18**	**0,15**	**687**	100,00%	20,85%
21							131

Find Orb con le misure ITALIA

Find_Orb -- Orbit Determination | 2025 FA22

Font

```
R1: 870726  R2: .19534  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD ResidFmt Language Gauss constr Epoch all_perts Undo FilterObs NonGravs Calend OrbCenter        [+] [?]
(1)Mer (2)Ven (o)Ear (4)Mar (o)Jup (6)Sat (7)Ura (8)Nep (9)Plu (o)Moo (a)Ast
Elong 157.7    Phase  20.1    RA vel -0.61'/hr   decvel -0.18'/hr   dT=3.58 sec
ang vel  0.64'/hr at PA 253.6   radial vel 11.270 km/s  cross -0.39                                                  09:19:48
Delta= .11126  r= 1.1036  mag=17.40  mag (computed)=17.93   2025 Oct  5 20:40:56.06
Sigma 0.5" MPS 2451819  Obj alt 60.0 az 115.0  Sun alt -39.8 az 310.3  Gaia-DR2
Mag sigma 0.5; time sigma 1
Orbital elements:  2025 FA22                                  MOIDs: Me  0.434891 Ve  0.159690 Ea  0.001589 Ma  0.030727
   Perihelion 2025 Aug 6.97815 ± 0.00085 TT = 23:28:31 (JD 2460894.47815)     MOIDs: Ju  3.145206 Sa  6.971206 Ur 16.339765 Ne 27.883430
Epoch 2025 Oct 18.0 TT = JDT 2460966.5   Earth MOID: 0.0016   Ma: 0.0307      Find_Orb ver: 2025 Nov 24
M  38.83270279 ± 0.0036          (J2000 ecliptic)            Find_Orb       Tisserand relative to Earth: 2.87827
n   0.53917944 ± 4.4e-5          Peri.  304.32785 ± 0.000053                 Earth encounter velocity 10.4670 km/s
a   1.49502055 ± 8.13e-5         Node   356.47022 ± 0.000032                 Barbee-style encounter velocity: 10.8910 km/s
e   0.4112517 ± 3.75e-5          Incl.    7.61798 ± 0.00053                  Diameter 182.5 meters (assuming 10% albedo)
P   1.828/667.669d         H 21.76  G  0.15   U  6.0                        Score: 0.597471
q 0.88019073 ± 8.25e-6    Q 2.10985038 ± 0.000171
679 of 685 observations 2025 Sept. 18-Oct. 18; mean residual 0".68
     YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
 KB2025 10 05.83986 00 23 53.611+26 38 38.47         16.9 GV~9DKi160     .19-  .04+  .11112 1.1035
 KB2025 10 05.84296 00 23 53.422+26 38 37.68         17.1 GV~9DKi160     .07-  .03-  .11114 1.1035
 KB2025 10 05.84615 00 23 53.198+26 38 36.89         16.9 GV~9DKi160     .34-  .06-  .11116 1.1035
 KC2025 10 05.85150 00 23 52.891+26 38 35.12         17.6 GV~9CBv104     .26+  .23-  .11119 1.1035
 KC2025 10 05.86176 00 23 52.210+26 38 32.42         17.4 GV~9CBv104     .07+  .38-  .11126 1.1036
 KC2025 10 05.87110300 23 51.59 +26 38 30.8          18.3 GV~9CBvG17     .22+  .08-  .11132 1.1037
 KC2025 10 05.87203 00 23 51.526+26 38 29.69         17.6 GV~9CBv104     .04-  .47-  .11133 1.1037
 KC2025 10 05.87854400 23 51.06 +26 38 29.0          18.2 GV~9CBvG17     .25-  .09+  .11137 1.1037
 KC2025 10 05.88598800 23 50.59 +26 38 27.1          18.1 GV~9CBvG17     .14+  .22+  .11142 1.1037
 KB2025 10 10.78926600 21 25.599+26 09 02.18         17.86GW~9DKiL92     .54+  .06-  .14433 1.1337
 KB2025 10 10.79650000 21 25.316+26 09 00.44         17.50GW~9DKiL92     .19+  .29+  .14438 1.1338
 KB2025 10 10.80351300 21 25.015+26 08 57.65         17.61GW~9DKiL92     .45-  .44-  .14443 1.1338
 KB2025 10 11.75414600 21 08.786+26 02 47.00         19.20GX~9DKiL34     .35+  .27+  .15097 1.1397
 KB2025 10 11.83167200 21 06.361+26 02 17.13         17.96GX~9DKiK78     .27-  .14+  .15150 1.1402
 KB2025 10 11.84823000 21 05.837+26 02 11.61         18.08GX~9DKiK78     .10-  .04+  .15161 1.1403
 KB2025 10 11.86443600 21 05.289+26 02 06.26         18.57GX~9DKiK78     .21-  .17+  .15172 1.1404
(104) San Marcello Pistoiese  (N44.064178 E10.803750)  Italy
(126) Monte Viseggi L. Zannoni Observatory  (N44.132565 E9.790150)  Italy
(160) Castelmartini  (N43.823058 E10.841440)  Italy
(203) GiaGa Observatory  (N45.541442 E8.995480)  Italy
(595) Farra d'Isonzo  (N45.915731 E13.525780)  Italy
(598) Loiano  (N44.259205 E11.334090)  Italy
(C82) Osservatorio Astronomico Nastro Verde, Sorrento  (N40.618774 E14.357590)  Italy
(D43) 45th Parallel Observatory, Pino Torinese  (N45.044579 E7.770390)  Italy
(D63) G. Pascoli Observatory, Barga (since June 2023)  (N44.081324 E10.461380)  Italy
(D98) Loiano TANDEM  (N44.259205 E11.334090)  Italy
(G17) BAS Observatory, Scandicci  (N43.752133 E11.202610)  Italy
(K78) iota Scorpii Observatory, La Spezia  (N44.126274 E9.853560)  Italy
(K83) Osservatorio Astronomico Beppe Forti, Montelupo  (N43.755330 E11.043170)  Italy
(L34) Galhassin Robotic Telescope, Isnello  (N37.939358 E14.020610)  Italy
(L73) Beato Ermanno Observatory, Impruneta  (N43.675406 E11.261830)  Italy
(L90) ABObservatory, Rosarno  (N38.455733 E15.979490)  Italy
(L92) San Costantino  (N38.705391 E16.002110)  Italy
(M26) Zen Observatory, Scandicci  (N43.774583 E11.134940)  Italy
(M50) Virtual Telescope Project, Manciano  (N42.480174 E11.563750)  Italy
(M57) Wide-field Mufara Telescope, Isnello  (N37.868879 E14.020200)  Italy
(M60) Virgil Observatory, Loiano  (N44.262335 E11.325540)  Italy                                                  665/685
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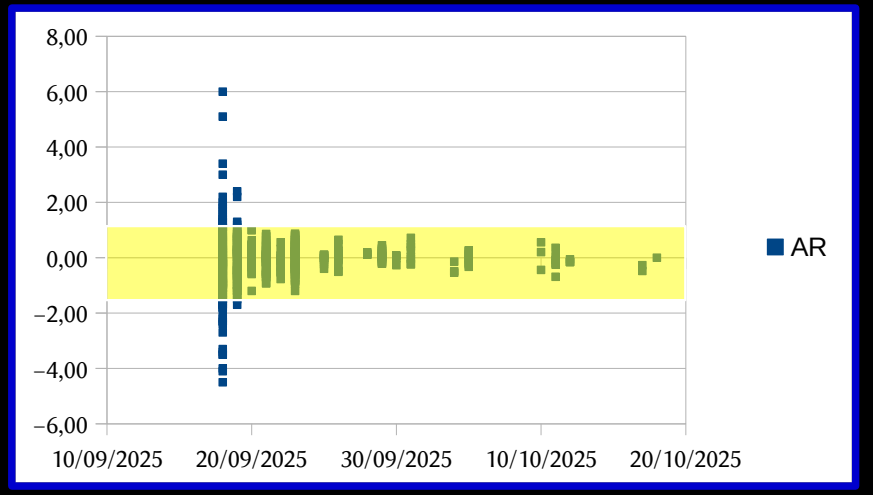
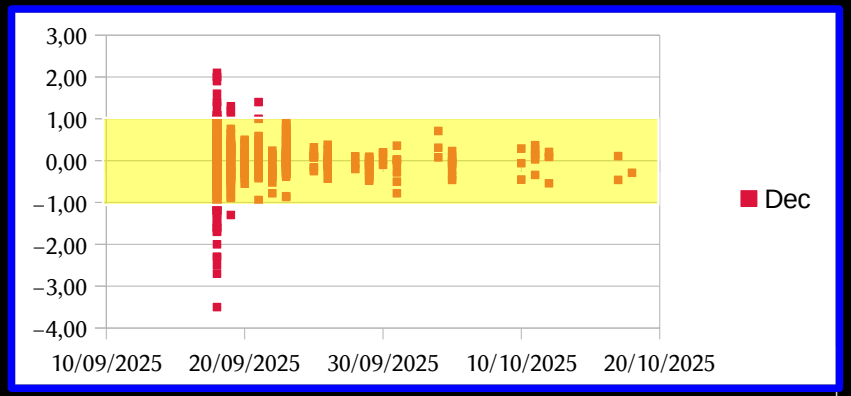
Find orb RA DEC residual ITALIA

- Utilizzando solo le misure fatte da osservatori italiani si è determinato l'orbita di 2025 FA22
- Sono stati estrapolati i residui in RA e DEC per ogni Misura
- Non si sono riscontrate differenze sostanziali con i residui riportati da NeoDys





NeoDys, Small-Body Database Lookup, Find Orb

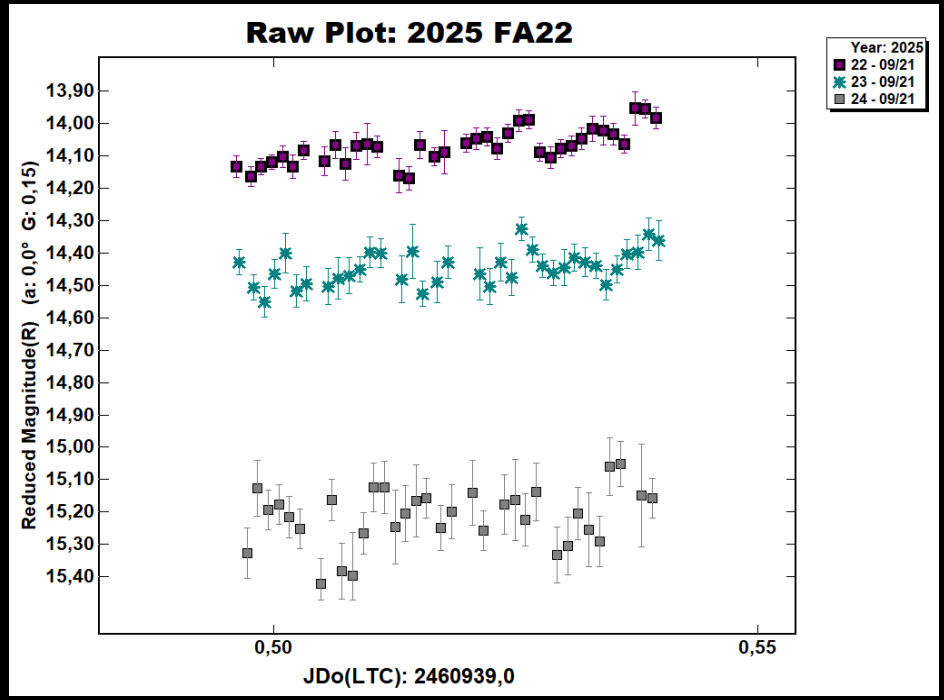
- Elementi orbitali pubblicati su NeoDys SBDL a confronto con quelli individuati da FindOrb, le misure sono state filtrate con residui maggiori di 1”
- Con tutte le misure
- Con tutte misure di osservatori italiani
- Con le misure di Osservatori del PndR Asteroidi UAI
- Differenze trovate negli elementi orbitali tra NeoDys (N) e SBDL (S) e quelle di FindOrb

			2856 – 3286	524 – 685	185				
	NeoDys	SBDL	F_O_ALL	F_O_ITA_all	F_O UAI	N-ITA_All	N-UAI	S-ITA_All	S-UAI
a	1,495570	1,495567	1,495569	1,495020	1,495261	0,000550	0,000309	0,000547	0,000306
e	0,411488	0,411488	0,411486	0,411251	0,411363	0,000237	0,000125	0,000236	0,000125
i	7,621000	7,621368	7,621340	7,617970	7,619580	0,003030	0,001420	0,003398	0,001788
Node	356,469000	356,468698	356,468520	356,470220	356,470310	–0,001220	–0,001310	–0,001522	–0,001612
Arg P	304,331000	304,330819	304,331300	304,278500	304,327680	0,052500	0,003320	0,052319	0,003139
H	21,60	21,59	21,61	21,76	21,53	–0,160000	0,070000	–0,170000	0,060000
Earth Moid	0,001370	0,001373	0,001600	0,001600	0,001600	–0,000230	–0,000230	–0,000227	–0,000227

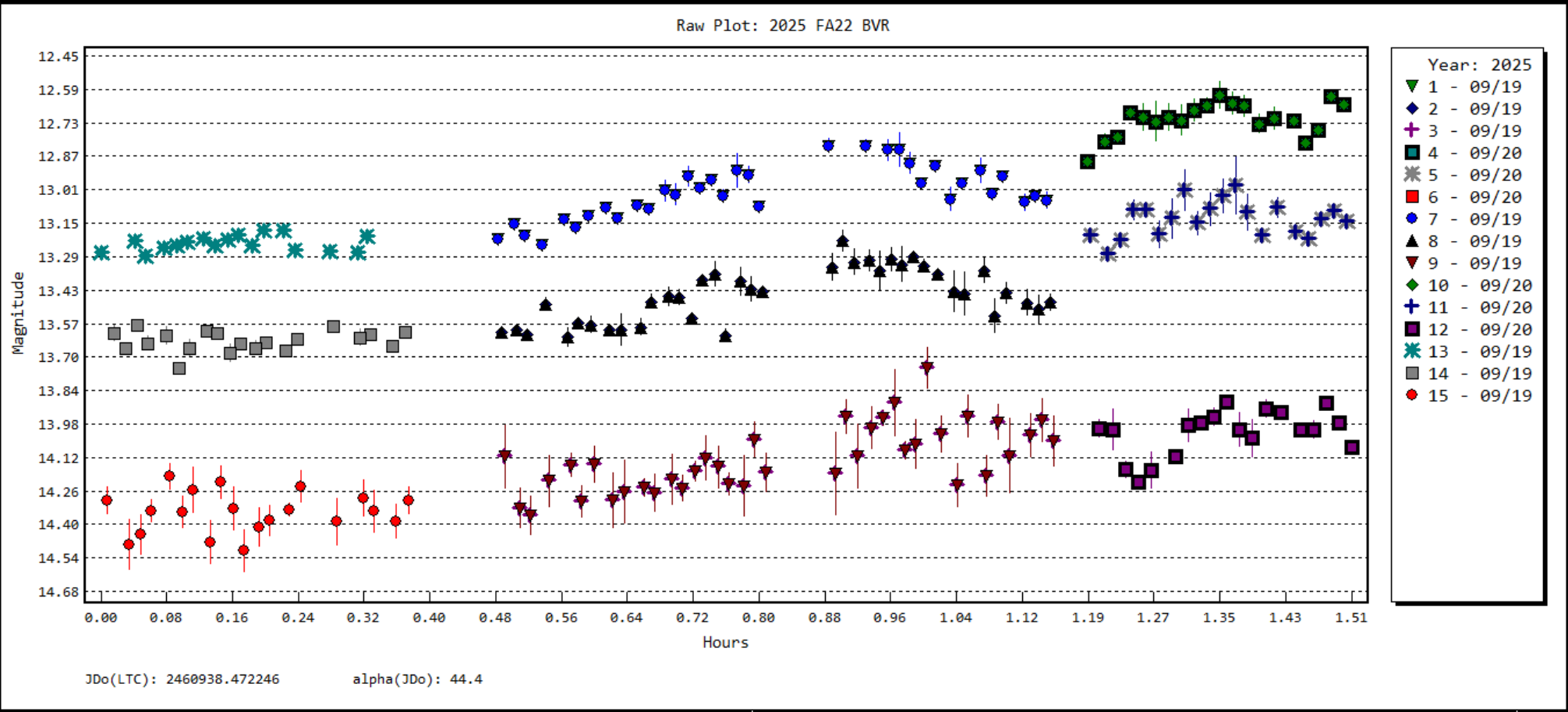
	N-ITA_All	N-UAI	S-ITA_All	S-UAI
a	82348	46274	81870	45796
	Km	36074		36074

2025 FA22 – Fotometria Sezione Asteroidi UAI

- Con i dati raccolti dagli osservatori dell UAI non è stato possibile determinare il periodo di rotazione, quello che risulta è un Periodo superiore alle 6H
- Si è determinato indice di colore di 2022FA22 che risulta essere
- V-R 0.40 ± 0.04
- B-V 0.70 ± 0.14



2025 FA22 - Fotometria Sezione Asteroidi UAI



2025 FA22 conclusioni

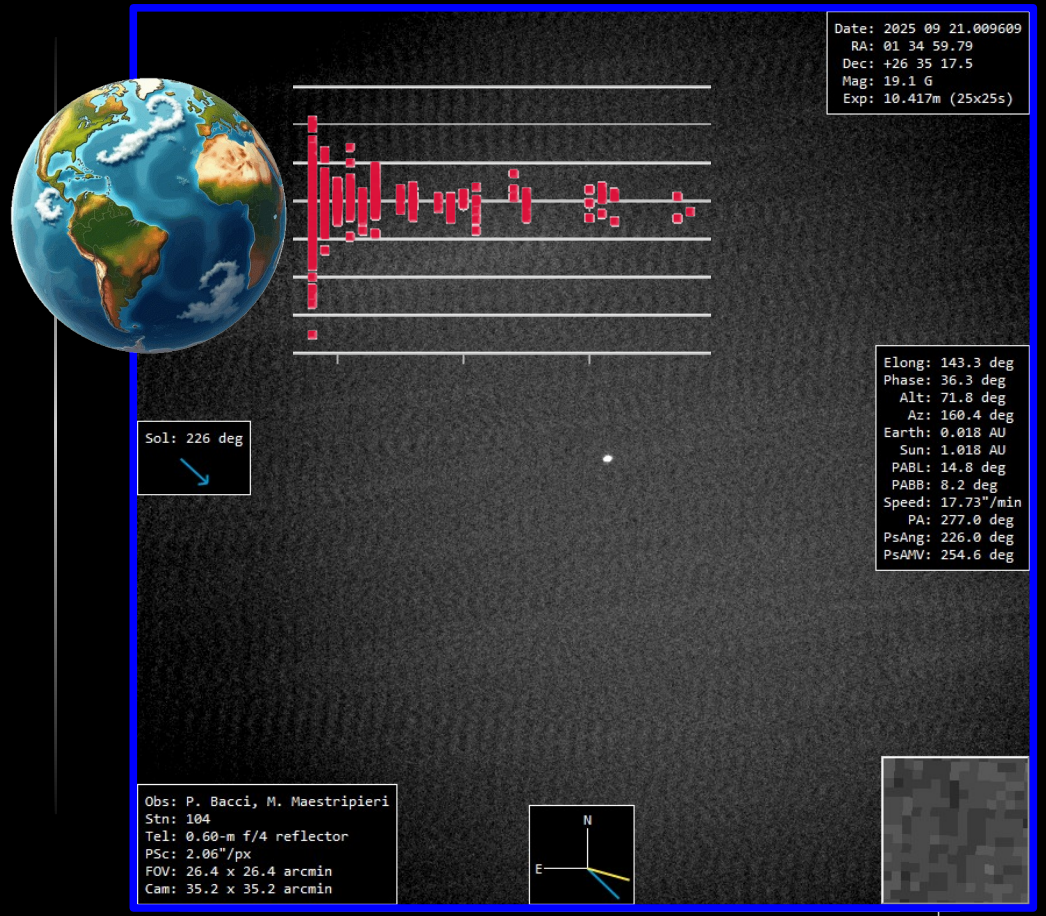
In attesa delle pubblicazioni ufficiali:

Astrometria:

- Buoni risultati degli osservatori del PNdR Asteroidi UAI con bassi residui
- Con astrometria degli osservatori del PNdR Asteroidi UAI sono stati ben definiti i parametri orbitali
- Si osservano residui alti in corrispondenza di elevato motion nonostante la buona luminosità dell'asteroide (13.0-15,0 mag), probabilmente riconducibile a un errore di timing.
- Eccessivo numero di misure astrometriche di alcuni osservatori

Fotometria PNdR Asteroidi UAI:

- L'indice di colore trovato risulta essere coerente con le informazioni ad oggi ricevute ...
- Il periodo di rotazione non è stato individuato, ma abbiamo appurato che è maggiore 6 h. (questo ha precluso il risultato finale)



2025FA22 Made in Italy

Grazie dell'attenzione

Relatore Paolo Bacci backman