

Professor Comet Report

Special Report 2016! A Tale of Two Comets



On the third and final full week of March 2016 (the dates of 20th – 26th) there are two comets on a perihelion approach to the Earth on the nights of 21 – 23 March 2016! The comets are 252P/LINEAR and P/2016 BA 14. This a short report on these comets in a rare two – comet flyby that happens once in every 150 years.

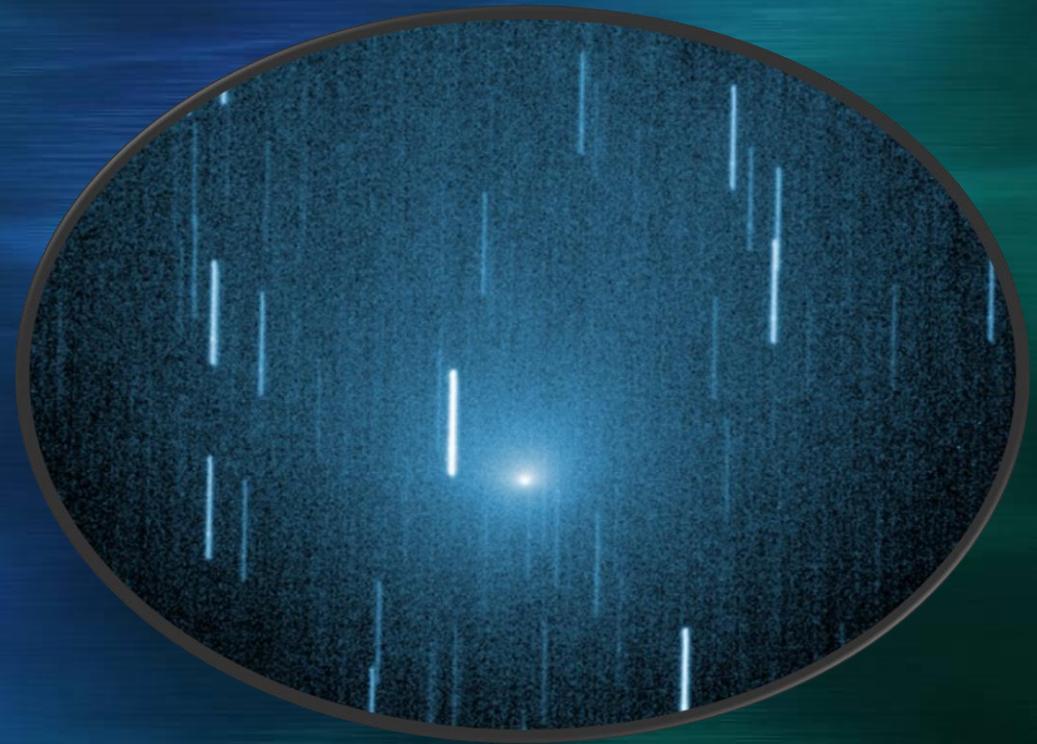
Read on all of the following ephemeris data, facts, sky charts, images, and other scientific facts about this rare treat for both Amateur and Professional Astronomers!

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Comet 252P/LINEAR

This is a 252nd confirmed periodic comet discovered by the famous LINEAR survey of Minor Planets! LINEAR is an abbreviation for the Lincoln Near – Earth Asteroid Research which is a US government program to search for all NEOs (Near Earth Objects) under the Spaceguard Initiative. This initiative has the purpose in the location, mapping, and astrometry (determining the coordinates and plotting the orbit) of all NEOs (Comets, Asteroids, etc.) of 1 km diameter or greater! To this date the Spaceguard initiative has located an estimated 90% of objects within the size category range that pose the greatest threat to life on Earth and Human civilization!

The LINEAR survey controlled by the MIT Lincoln Laboratory is a significant contributor to NEO research and Space Surveillance since March 1998. The original 1.0m telescope system located at White Sands Missile Test Range in Central New Mexico was recently decommissioned and a new Space Surveillance Telescope (3.5m SST) is undergoing final preparations to continue the LINEAR Survey! The nucleus is estimated to be about ~750 feet (230 meters) in size.

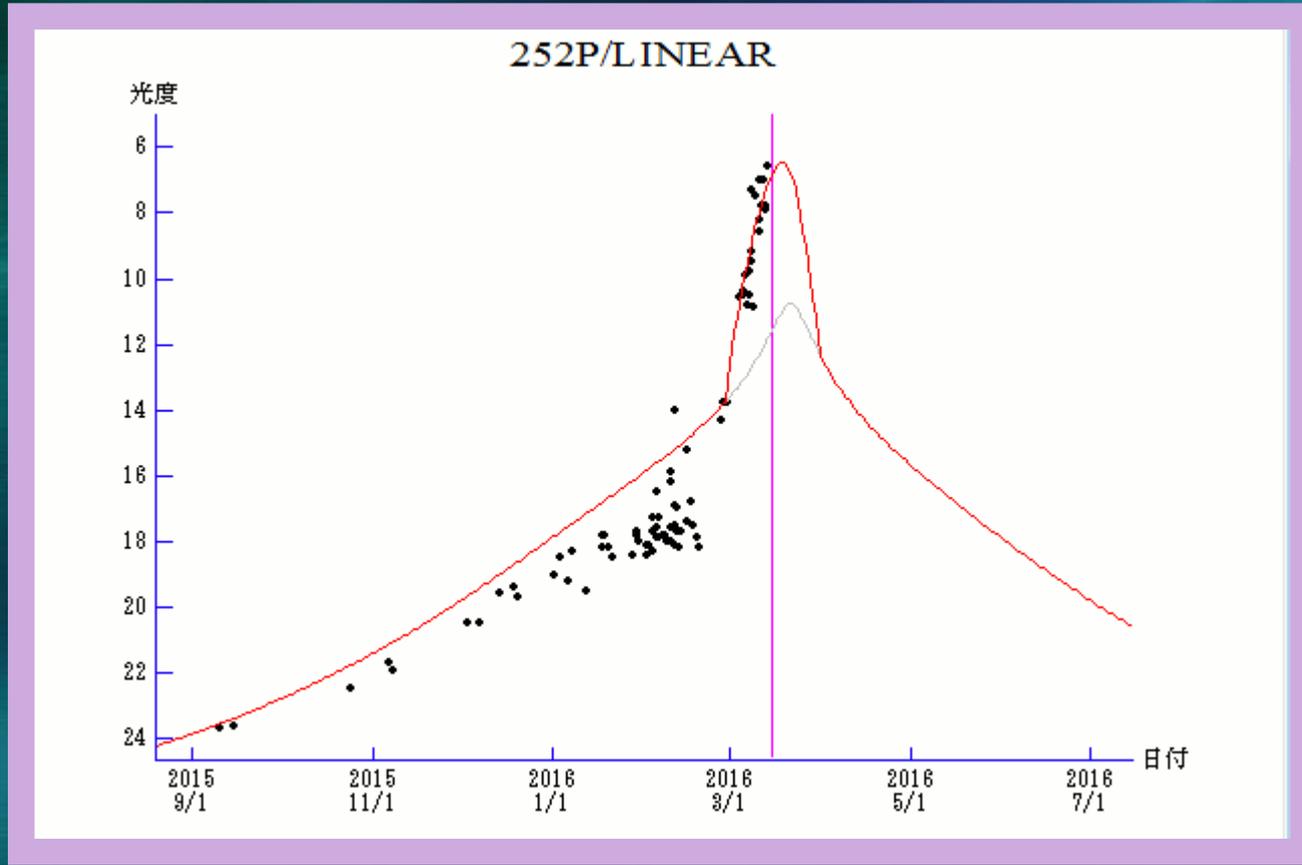


Courtesy of

*Jean – Francois Soulier, France
0.4m f/8 RC Telescope + CCD
14 March 2016*

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Figure One: The Photometry Profile of 252P/LINEAR



This shows the photometry profile of 252P/LINEAR ranging from 1 Sept 2015 through mid July 2016. The horizontal axis is the time period on a daily basis and the vertical axis corresponds to visual magnitude (6th - 24th). The pink line shows the comet at perihelion and the black dots are confirmed sightings either visual or acquired astrophotos which span from early to mid September 2015 up to 18 March 2016. Note the light curve below the modified orange curve above! The change in the light prediction curve is based on the normalization and prediction of all current reports up to the last recorded date! Any change in the curvature is due to unexpected changes in the comet's morphology!

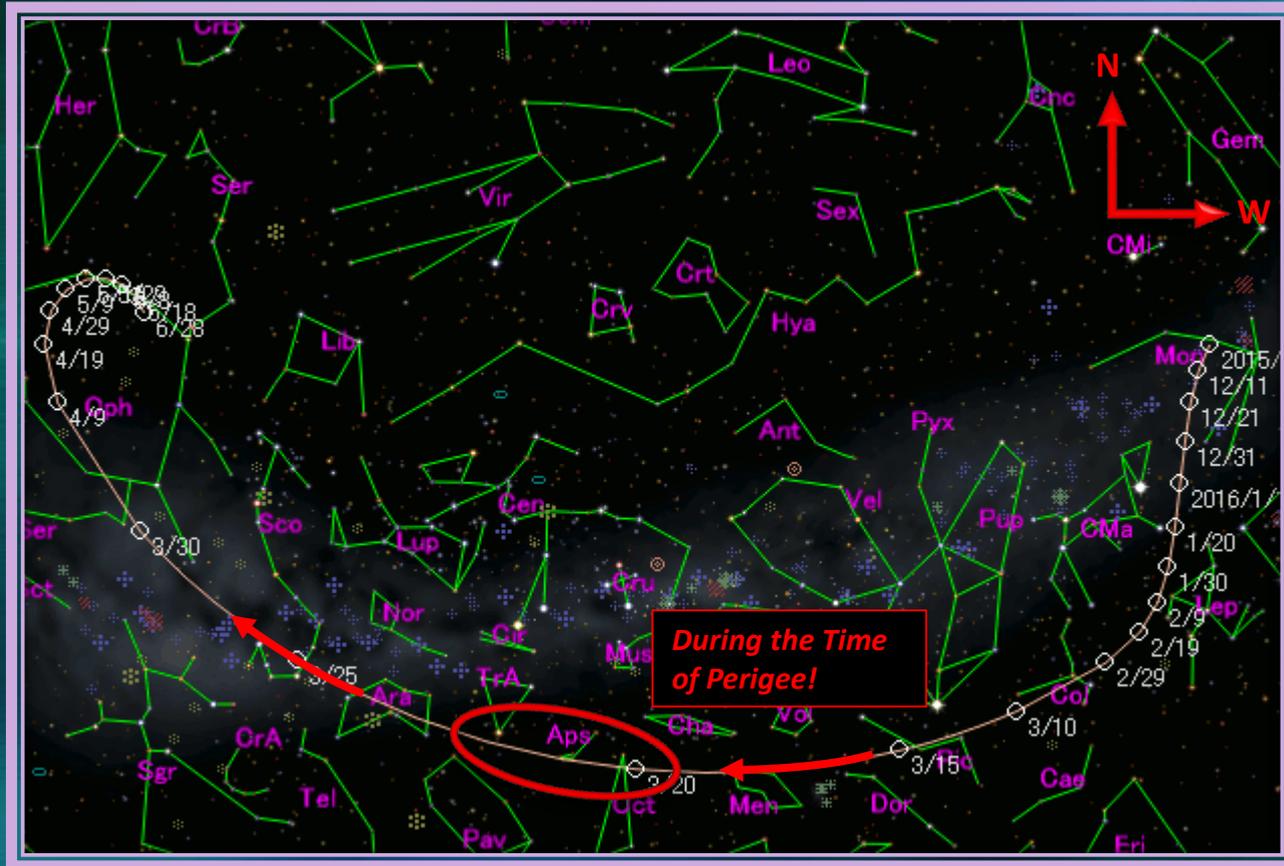
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Figure Two: Current Facts about Comet 252P/LINEAR

Ephemeris and Info Parameter	Numerical Value with Appropriate Units
Brightest Visual Magnitude	4.9 (20 March 2016 @ 05:31:12 UTC) William Souza, Sao Paulo, Brazil
Date of Discovery	7 April 2000 @ 10:48 UTC (F Shelly, LINEAR, New Mexico, USA)
Perigee	0.036 AU (5 385 523 km or 3 344 409 mi) 20 – 22 March 2016
Orbital Eccentricity	0.674 (Very Elliptical)
Semi – Major Axis (Avg. Distance from the Sun)	3.05 2 AU (456 572 701 km or 283 531 647 mi)
Perihelion	0.99 6 AU (Close to the Avg. Distance between the Earth & Sun!)
Time of Perihelion Passage	2 457 462.784 854 4 Julian Date (15 March 2016 @ 06:50:11.4 UTC)
Aphelion	5.108 AU (764 145 923 km or 474 534 618 mi) Domain of Jupiter's Orbit (A Jovian Comet!)
Orbital Inclination (With Respect to the Plane of the Elliptic)	10.404 6° (10° 24' 16.6")
Mean Motion (Apparent view of motion in the celestial skies!)	0.184 85°/day or 11' 5.5"/day
Orbital Period (Sun at one Foci in its elliptical orbit)	5.33 years or 1 947.509 4 Days (1947 days 12 hrs 13 mins 32.16 secs)
Estimation of Coma Size	60' to 80' (1.94 - 2.58 Avg. Full Moons Across)
Degree of Condensation	2 (Diffuse Coma with a Definite central brightness!)

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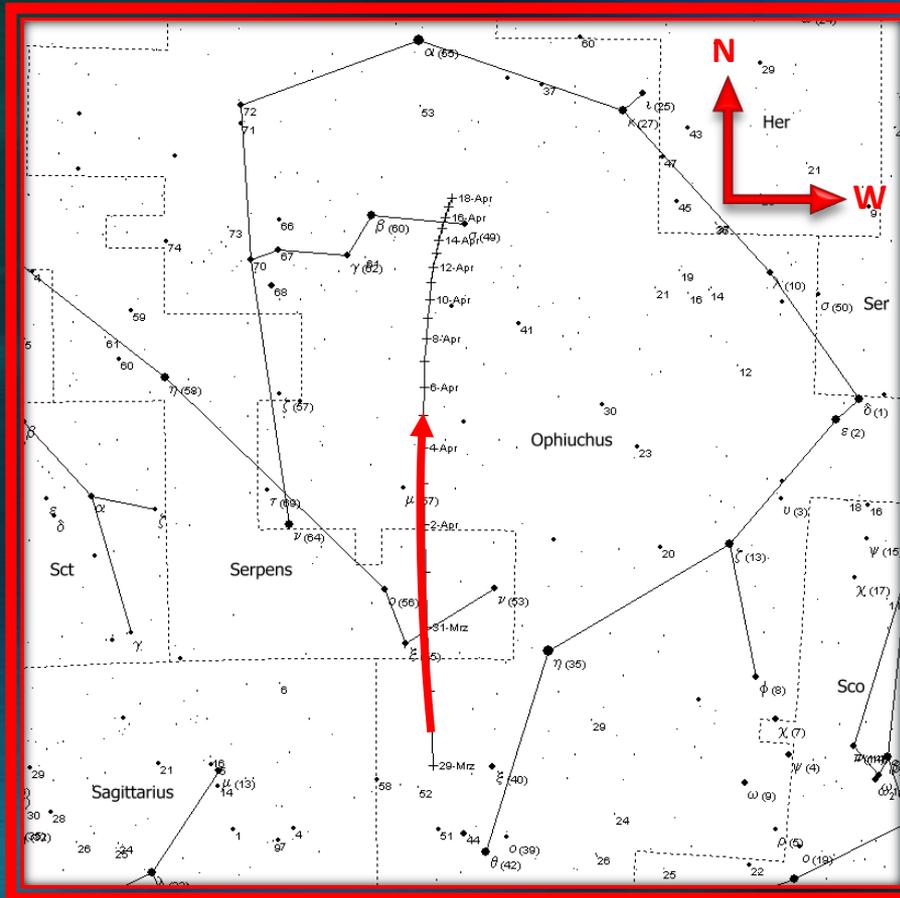
Figure Three: General Sky Chart for 252P/LINEAR



Unfortunately this comet is approaching and departing around the day of perigee in the Southern hemisphere around the constellations of Octans, Apus, Triangulum Australe, Pavo, and Ara beyond the observational capabilities of Astronomers in the Northern Hemisphere. The comet is moving in an Eastward direction away from the constellations of the Spring Skies (Northern Hemisphere) or Autumn Skies (Southern hemisphere) towards the constellations of Scorpius and Ophiuchus. The comet will become visible to Astronomers of the Northern hemisphere around the time of late March in the Early morning hours before the beginning of morning nautical twilight! 252P/LINEAR will be receding from Earth post perihelion and perigee back towards the Jupiter realm of the Solar System and will rapidly decline in brightness to 16th magnitude visual before 1 May! Expect the comet to be dimmer than 12th Magnitude by mid April.

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Figure Four: General Sky Chart of 252P/LINEAR for observers in the Northern Hemisphere!



Courtesy of Winnie's Comet Pages, 1 Jan 2016.

Here we have the comet visible in the early morning hours around Nautical twilight from (29 March – 18 April) 2016 moving northward after an eastward motion from the constellations of the Spring Skies to the celestial Summer Sky prior to undergoing retrograde motion for the rest of the year as it moves towards the Jovian domain of the Solar System! The comet will have past its peak visual brightness and observers for the northern hemisphere will be reduced to observing the comet in telescopes as it diminishes in brightness from 12th to 16th magnitude visual!

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Figure Five: Orbital Diagram of 252P/LINEAR @ 21 March 2016

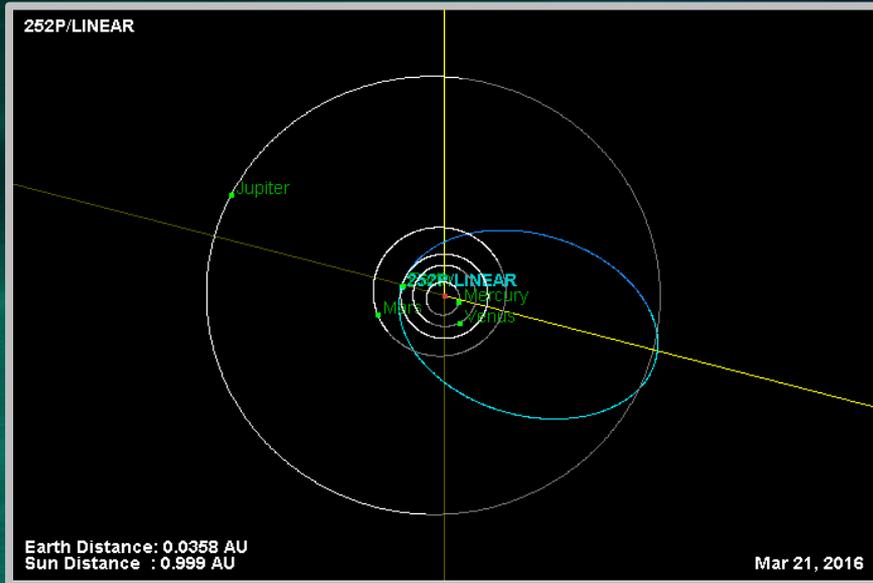


Figure 5.1: Overhead View

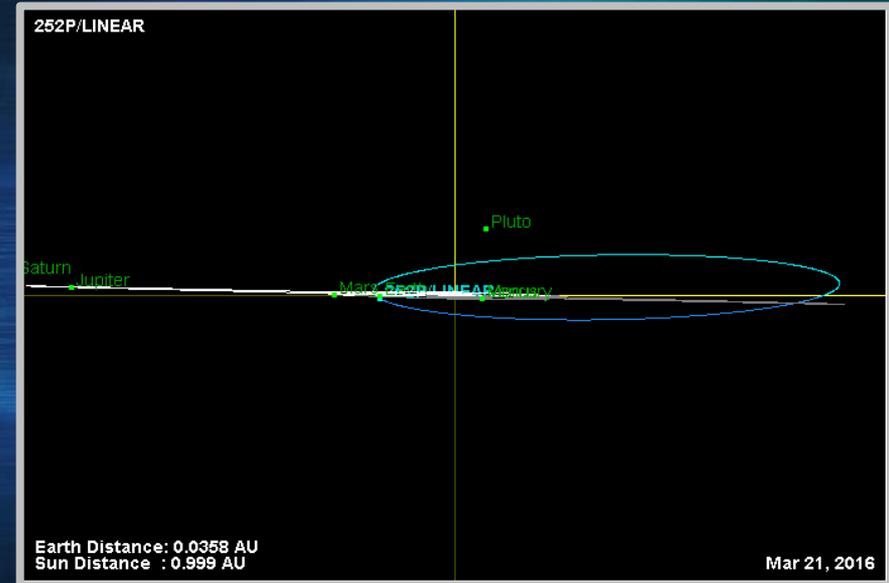


Figure 5.2: Side View

Notice that the Light Blue shows part of the comet's orbital path above the plane of the elliptic (plane of the Earth's orbit) and the Dark Blue being that part of the comet's orbital path below the plane of the elliptic!

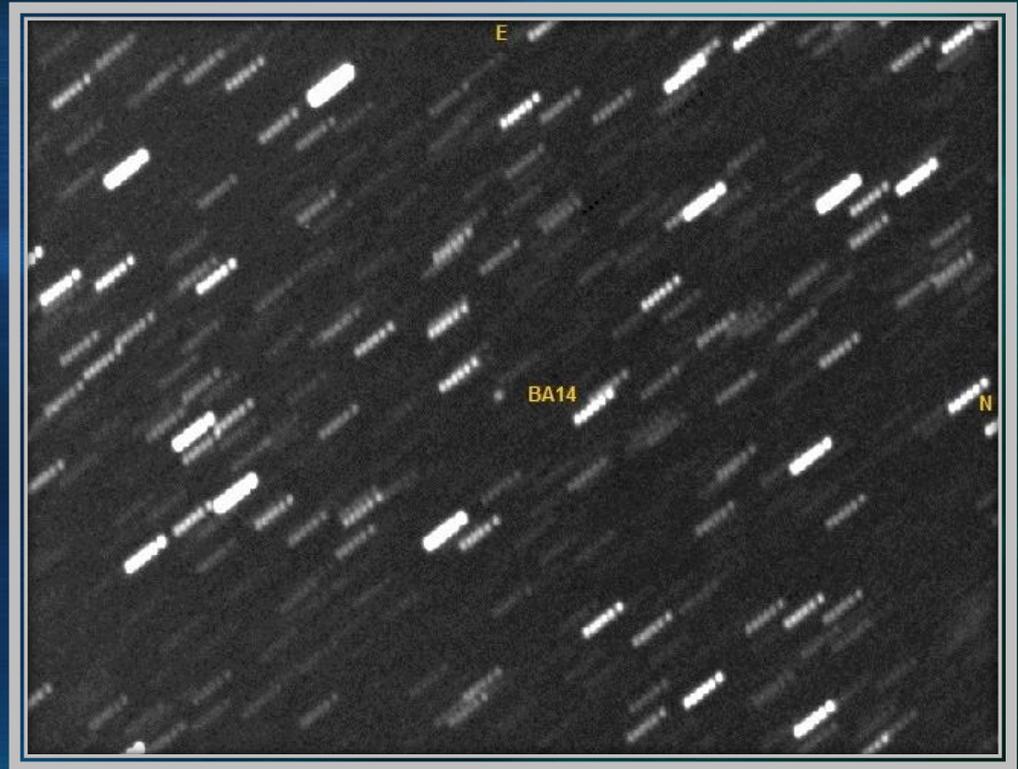
The orbital diagrams are courtesy of NASA/JPL Solar Systems Dynamic (Small Body Database Browser)!

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Comet P/2016 BA14 (PanSTARRS)

This is another comet with virtually identical orbital perimeters to that of Comet 252P/LINEAR. This object could be a possible fragment of Comet 252P/LINEAR. If it is a piece of the LINEAR comet it could have detached two likely possibilities: an impact or collision with another minor planet OR progressive sublimation of ices and volatiles. This could mean that the original nucleus was likely a combination of two separate components combined by an overlapping mixture of frozen ices that kept the nucleus together. However, it could have developed under the same fate as Shoemaker – Levy 9 when it was torn apart of gravitational tidal effects due to Jupiter!

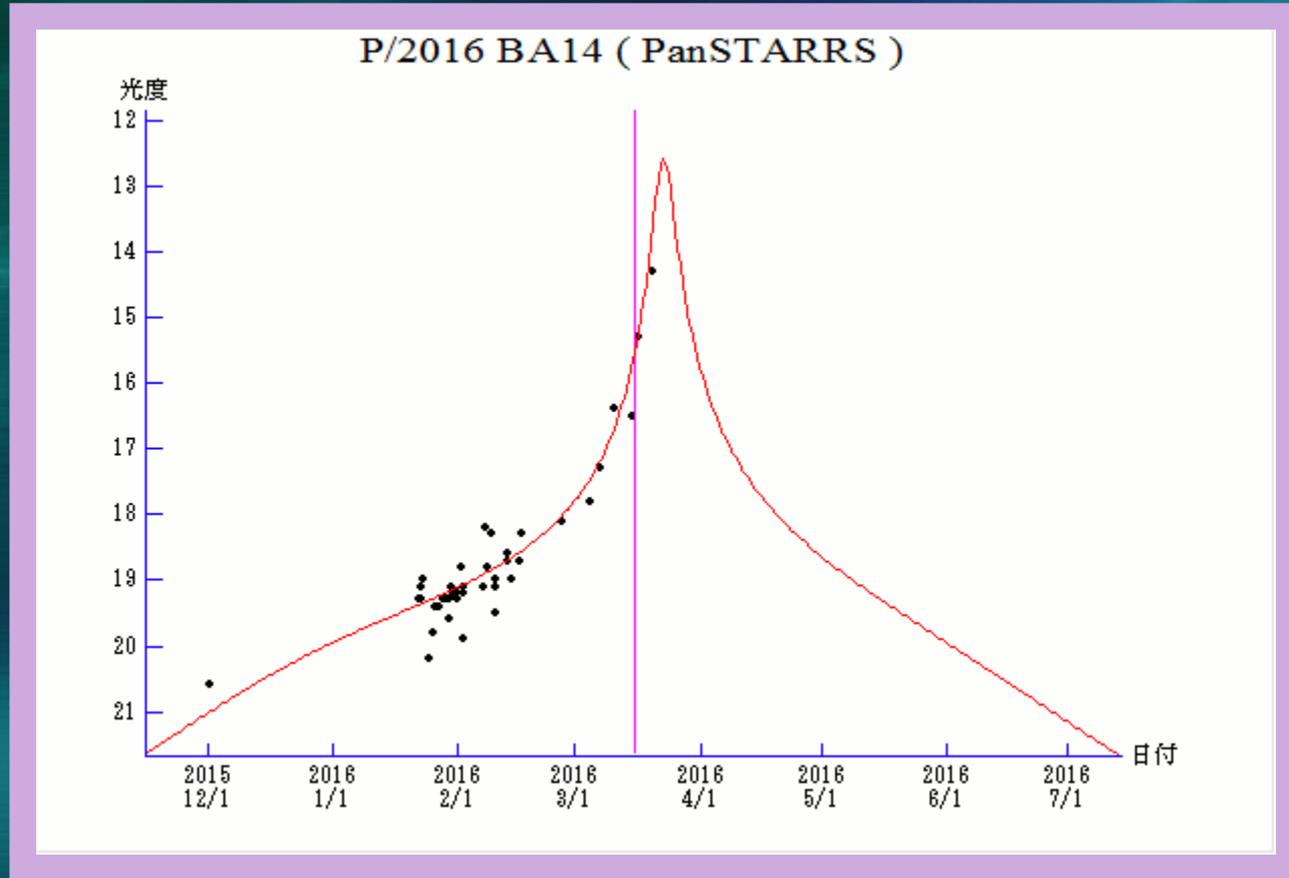
Comet P/2016 BA14 is a very faint comet of mid – 12th magnitude visual and was discovered using the PanSTARRS survey out of the state of Hawai'i on 22 January 2016 at 19.6 magnitude visual. This object will approach the Earth and be at perigee the following night (22 – 23) March after 252P/LINEAR's time of perigee passage. It's perigee of 0.0237 AU will place at a closer approach than 252P/LINEAR. In spite of its similar orbital parameter the comet will be visible in the Northern celestial skies and impossible for view by Astronomers of the Southern Hemisphere. This is opposite the case with 252P/LINEAR. Unfortunately, the Moon will be at Full phase and even with a maximum elongation of 40° from the Moon this comet will require at least an 8" telescope for successful observation!



Courtesy of
Mike Olason, Denver, Colorado, USA
11" f/6 SCT + STF – 8300 M
17 March 2016

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Figure Six: The Photometry Profile of P/2016 BA14 (PanSTARRS)



This photometry profile was possible using a windows program 'Comets for Windows' by Seiichi Yoshida. The horizontal and vertical axis are the same as shown for the photometry profile for Comet 252P/LINEAR with the pink line indicating Perihelion passage! In spite of fewer observation data points the profile has a continuous, sharp curve indicate a progressively quick rate of brightness and dimness although it is more skewed towards post perihelion!

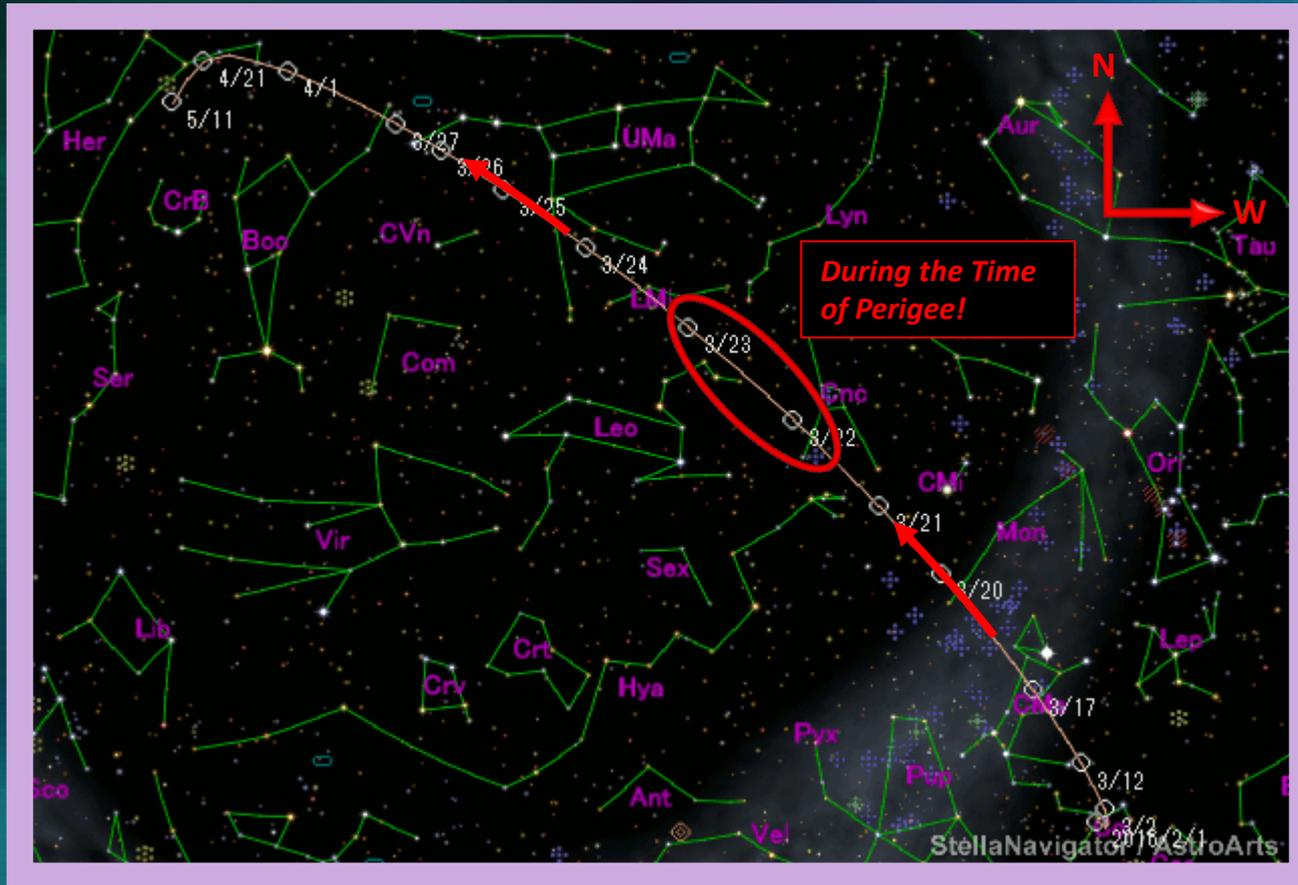
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Figure Seven: Current Facts about Comet P/2016 BA14 (PanSTARRS)

Ephemeris and Info Parameter	Numerical Value with Appropriate Units
Brightest Visual Magnitude	12.9 (Predicted) 22 – 23 March 2016
Date of Discovery	22 January 2016 (Pan-STARRS 1 Telescope, Haleakala, Hawai'i, US)
Perigee	0.0237 AU (21 – 23 March 2016) (3 545 470 km or 2 201 737 mi)
Orbital Eccentricity	.6655 (Very Elliptical) Similar to 252P/LINEAR
Semi – Major Axis (Avg. Distance from the Sun)	3.015 AU (451 037 580 km or 280 094 337 mi)
Perihelion	1.008 5 AU (Close to the Avg. Earth – Sun Distance)
Time of Perihelion Passage	2 457 462.980 128 9 Julian Date (15 March 2016 @ 11:31:23.14 UTC)
Aphelion	5.021 6 AU (751 220 668 km or 466 508 035 mi)
Orbital Inclination (With Respect to the Plane of the Elliptic)	18.927 93° (18° 55' 40.55")
Mean Motion (Apparent view of motion in the celestial skies!)	0.188 262°/day (11' 17.7"/day)
Orbital Period (Sun at one Foci in its elliptical orbit)	5.24 years or 1 912.226 6 days (1 912 days 5 hrs 26 min 18.24 secs)
Estimation of Coma Size	Stellar in size (No Measurements Available)
Degree of Condensation	1 (Diffuse Coma with a slight, central Brightness)

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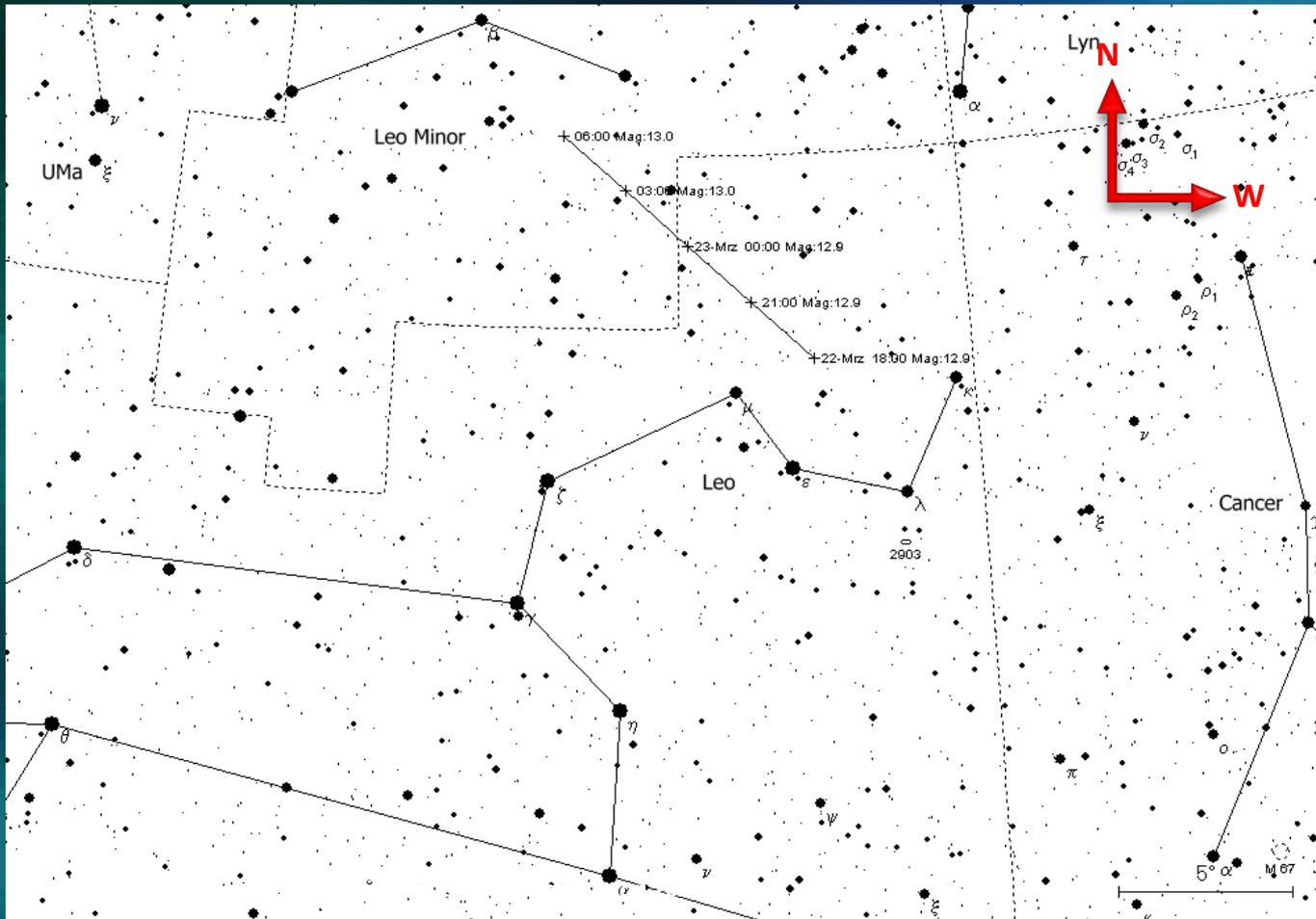
Figure Eight: General Sky Chart for P/2016 BA14 (PanSTARRS)



Here is the path of Comet P/2016 BA14 (PanSTARRS) as it approaches and departs from the Earth in the region of the constellations: Cancer, Leo, Leo Minor, and Lynx. The comet is moving in a progressive NE direction towards the Ursa Major, Boötes, and Hercules by late April. The sky chart is courtesy of StellarNavigator AstroArts program via Seiichi Yoshida's Comets Website for 21 March 2016!

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Figure Nine: General Sky Chart of P/2016 BA14 (PanSTARRS) for observers in the Northern Hemisphere!

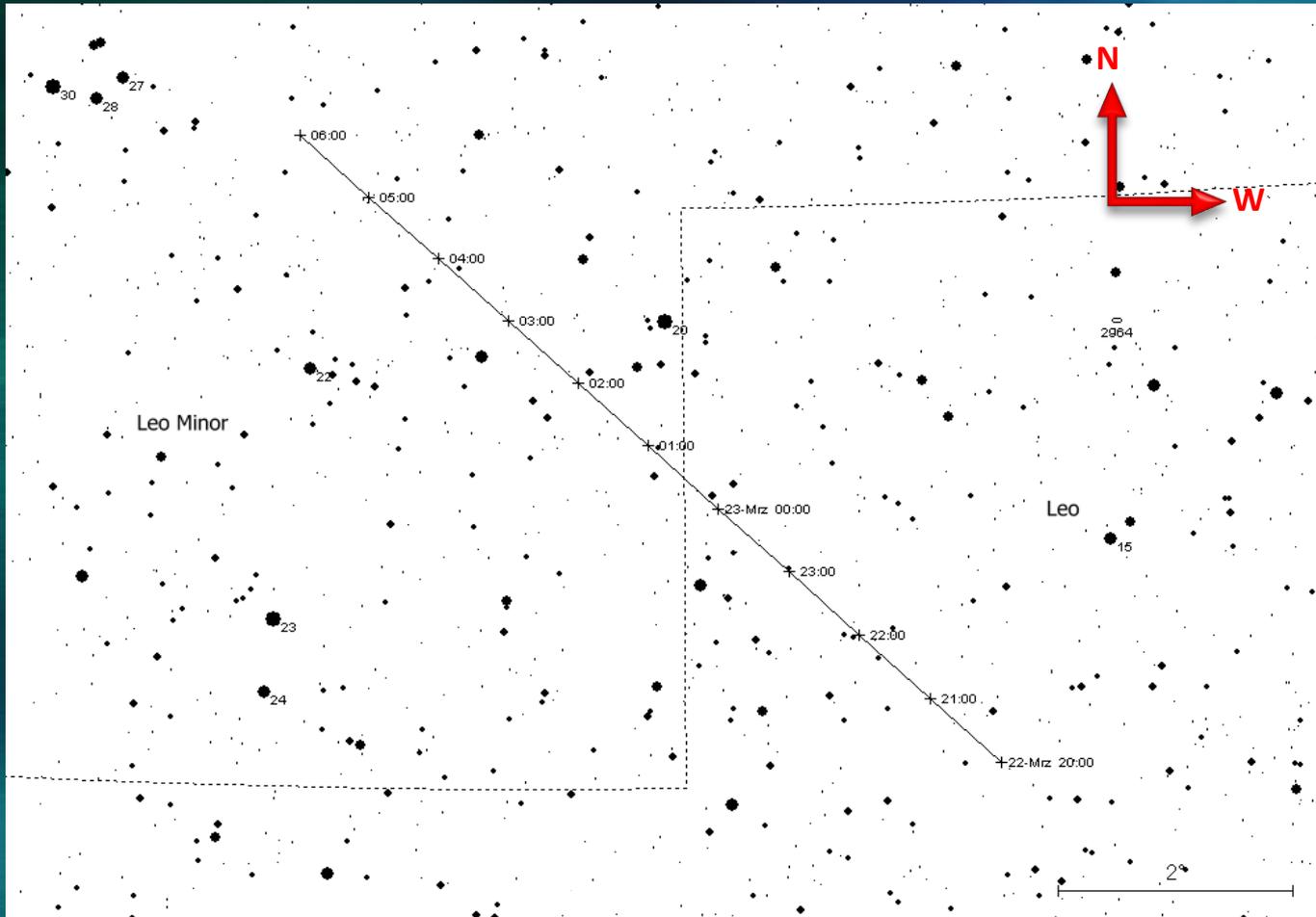


Courtesy of Winnie's Comet Pages, 1 January 2016.

This is the NW Progression of the comet as it moves from the northern region of Leo to the south, central region of Leo Minor from 22 March @ 18:00 UTC to 23 March @ 06:00 UTC as it reaches a predicted maximum visual magnitude of 12.9 to 13.0!

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Figure Ten: General Sky Chart of P/2016 BA14 (PanSTARRS) for observers in the Northern Hemisphere II!



Courtesy of Winnie's Comet Pages, 1 January 2016.

This is a close up as it crosses the constellation boundary between Leo and Leo Minor from 22 March @ 22:00 UTC to 23 March @ 06:00 UTC. While the comet passes through this part of the celestial Spring Skies in the East the Full March Moon will make observations of this comet very difficult and only a handful of stars will be useful for celestial navigation!

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Figure Eleven: Orbital Diagram of P/2016 BA14 (PanSTARRS) @ 21 March 2016

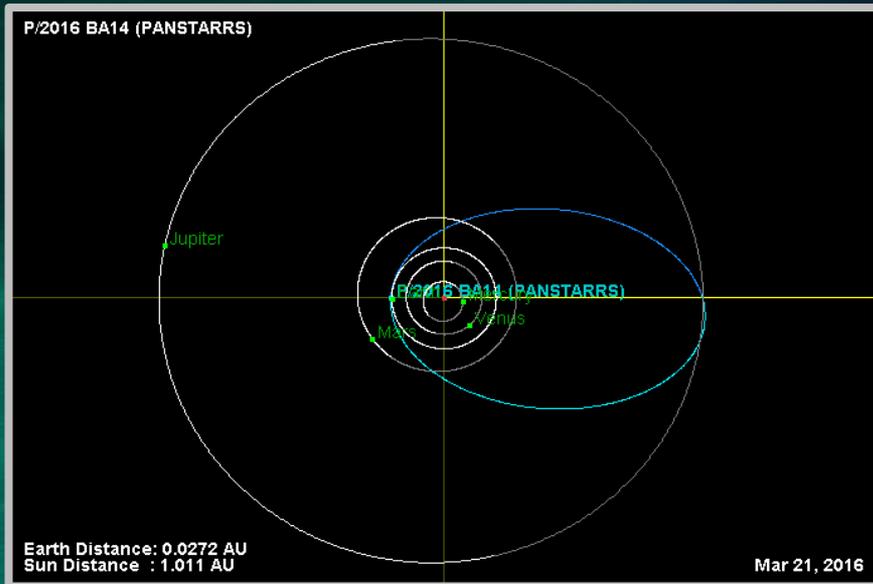


Figure 11.1: Overhead View

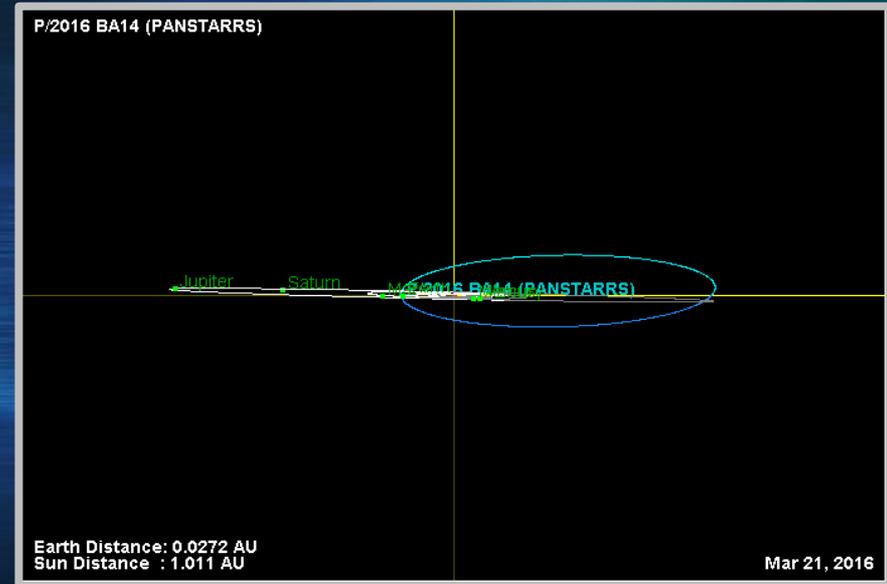


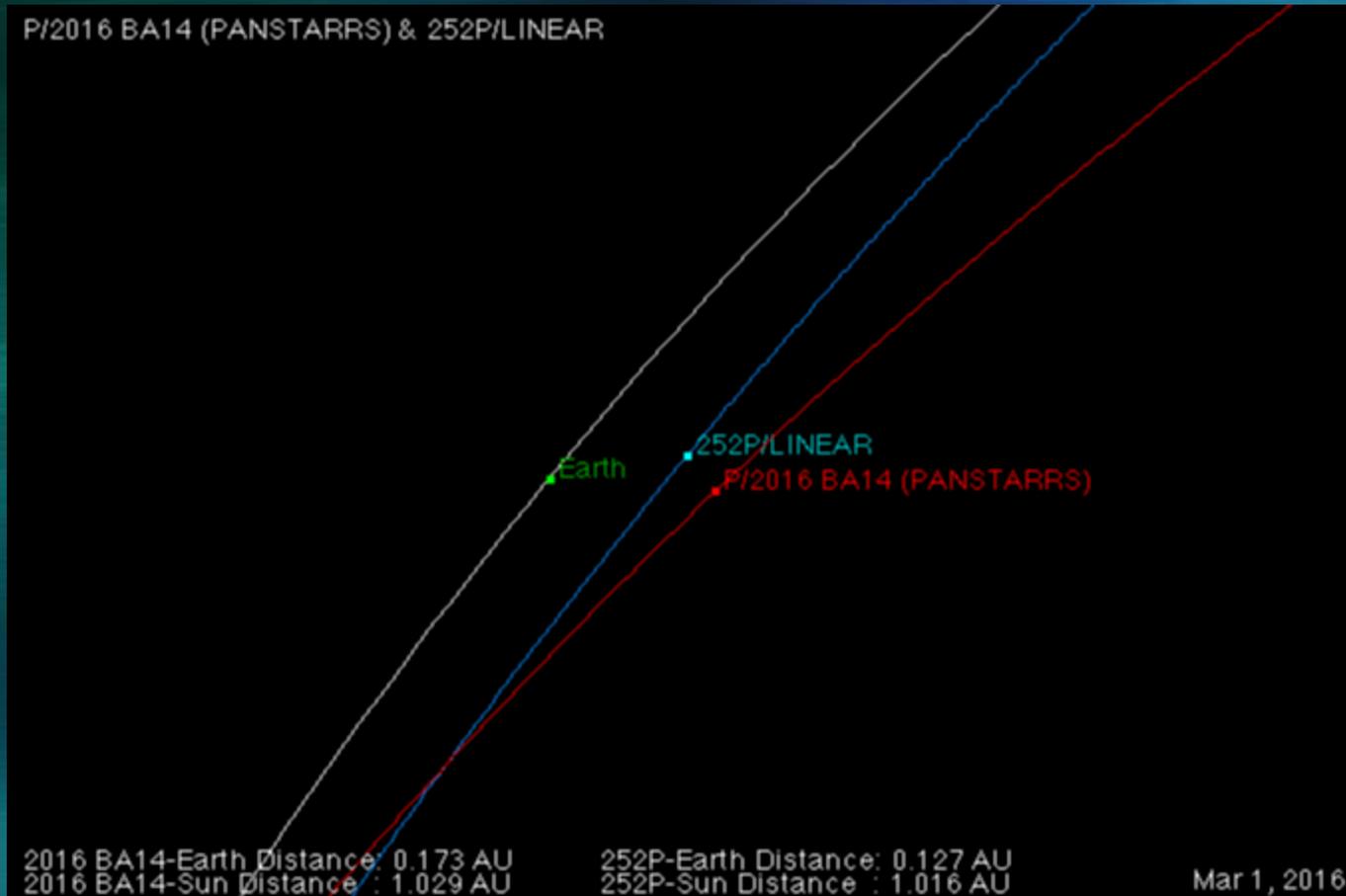
Figure 11.2: Side View

Notice that the Light Blue shows part of the comet's orbital path above the plane of the elliptic (plane of the Earth's orbit) and the Dark Blue being that part of the comet's orbital path below the plane of the elliptic!

The orbital diagrams are courtesy of NASA/JPL Solar Systems Dynamic (Small Body Database Browser)!

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Figure Twelve: Animated Gif of the Two Comets (1 March – 1 April) 2016.



This is an animated gif showing the combined orbital motion of both comets with their individual approaches and departures of Earth at or around their respective times of perigee approach!

The orbital diagrams are courtesy of NASA/JPL Solar Systems Dynamic (Small Body Database Browser)!

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March 22, 2016

A Tale of Two Comets!

Comet 252P LINEAR



Comet 2016 BA14 (PANSTARRS)

