1 au = 1.496e+8 km   1 LD (lunar distance) = 384402 km

<mark>**PHAs:MOID <= 0.05 AU ; Absolute Magnitude H <= 22; Diameter > 0.14 km**</mark>

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An object is considered a PHO if its minimum **orbit intersection distance (MOID)** with respect to Earth is less than <u>0.05 AU</u> (7,500,000 km; 4,600,000 mi) – approximately 19.5 lunar distances – and its absolute magnitude is brighter than 22, approximately corresponding to a diameter above 140 meters (460 ft).

Lunar distance (LD), also called Earth-Moon distance is a unit of measure in astronomy. It is the average distance from the center of Earth to the center of the Moon

One astronomical unit is defined as the average distance from the Earth to the Sun, approximately 93,000,000 (93 million) miles.

Perihelion distance is the closest point in an object's orbit.

Aphelion distance is the longest distance in an object's orbit.

Universal Time (UT) is **a time standard that reflects the average speed of the Earth's rotation**. It is not measured by clocks but by looking at the stars.

Column names with description:

1. Spkid ID – Object Primary SPK-ID
2. full_name – Object Full name/designation
3. pdes – Object Primary Designation
4. name – Object International Astronomical Union (IAU) Name
5. prefix – Comet Designation Prefix
6. neo – Near Earth Object (Y/N) Boolean
7. pha – Potentially Hazardous Asteroid (Y/N) Boolean
8. sats – Number of known Satellites
9. H – Absolute Magnitude Parameter
   - It measures the brightness of a celestial object if it was placed at **10 parsecs (32.6 light years)** from Earth.
10. G - Magnitude Slope Parameter (default 0.15)
11. M1 – Comet Total Magnitude Parameter
12. M2– Comet Nuclear Magnitude Parameter
13. K1 - Comet Total Magnitude Slope Parameter
14. K2 - Comet Nuclear Magnitude Slope Parameter
15. PC – Comet Nuclear Magnitude law-phase Coefficient
16. Diameter – Object Diameter (from equivalent sphere) KM
17. Extent – Object bi-tri ellipsoid dimensions KM
18. Albedo – Geometric albedo
    - The total radiation reflected from an object compared to the total incident radiation from the Sun.

19. rot_per – Rotation Period (h)
20. GM – Standard Gravitational Parameter: Product of Mass M and Gravitational Constant (KM^3/s^2)
21. BV – color index B-V magnitude difference
    - a star by the difference in its brightness (magnitude) in two images, one with a blue filter (B) and another. with a visual filter (V). (i.e., B = mB; V = mV) This difference, denoted (B-V), is a crude measure of the temperature
22. UB - color index U-B magnitude difference
    - The **UBV photometric system** (from *Ultraviolet, Blue, Visual*), also called the Johnson system (or **Johnson-Morgan system**), is a photometric system usually employed for classifying stars according to their colors. **To measure temperature of object**
23. IR - color index I-R magnitude difference
    - the difference between the magnitude of the star in one filter and the magnitude of the same star in another filter. I-infrared R-red
24. spec_B – Spectral Taxonomic Type (SMASSII)
25. spec_T - Spectral Taxonomic Type (Tholen)
26. H_sigma – 1 sigma uncertainty in absolute magnitude H
27. diameter_sigma - 1 sigma uncertainty in object diameter KM
28. orbit_id – Orbid Solution ID
29. epoch – epoch of osculation in Julian day from (TDB)
30. epoch_mjd – epoch of osculation in modified Julian day from (TDB)
31. epoch_cal - epoch of osculation in calendar date/time from (TDB)
32. equinox – equinox of reference frame
33. e - eccentricity
    - Eccentricity is a measure of how circular an orbit is. An eccentricity of 0 means that the orbit a perfect circle. Anything between 0 and 1 is an elliptical orbit. An eccentricity of exactly 1 gives a parabola, which isn't much or an orbit at all, but rather an escape trajectory
34. a – semi-major axis (au)
35. q – perihelion distance (au)
36. i – inclination (angle with respect to x-y elliptical plane in degree)
37. om – longitude of ascending node (deg)
38. w – argument of perihelion (deg)
39. ma – Mean Anomaly (deg)
40. ad – Aphelion Distance (au)
41. n – mean motion (deg/d)
42. tp – time of perihelion passage (TDB)
43. tp_cal - time of perihelion passage (TDB)
    - The date and time at which an object orbiting the Sun is at its closest to the Sun
44. per – sidereal orbital period (days)
45. per_y - sidereal orbital period (years)
    - The orbital period is the amount of time a given astronomical object takes to complete one orbit around another object.
46. moid – Earth minimum orbit intersection distance (au)

- The minimum orbital intersection distance (MOID) is used as a measure to assess potential close approaches and collision risks between astronomical objects.
- An object is classified as a PHA – that is, posing a possible risk to Earth – if, among other conditions, its Earth MOID is less than 0.05 au.

47. moid_ld - Earth minimum orbit intersection distance (LD)
48. moid_jup - Jupiter minimum orbit intersection distance (au)
49. t_jup – Jupiter Tisserand Invariant

- T_J, Tisserand's parameter with respect to Jupiter as perturbing body, is frequently used to distinguish asteroids (typically) from Jupiter-family comets (typically).[3]
- The minor planet group of damocloids are defined by a Jupiter Tisserand's parameter of 2 or less ($T_J \leq 2$).[4]

50. sigma_e – eccentricity (1 sigma uncertainty)
51. sigma_a – semi-major axis (1 sigma uncertainty) au
52. sigma_q – perihelion distance (1 sigma uncertainty) au
53. sigma_i – inclination (1 sigma uncertainty) degree
54. sigma_om - longitude of ascending node (deg) (1 sigma uncertainty)
55. sigma_w - argument of perihelion (deg) (1 sigma uncertainty)
56. sigma_ma – mean anomaly (1 sigma uncertainty)
57. sigma_ad - Aphelion Distance (1 sigma uncertainty) (au)
58. sigma_n - mean motion (deg/d) (1 sigma uncertainty)
59. sigma_tp - time of perihelion passage (days) (1 sigma uncertainty)
60. sigma_per – sidereal orbital period (days) (1 sigma uncertainty)
61. class – Orbital classification
62. producer – Name of person/institute who computed the orbit
63. data_arc – Number of days spanned by the data-arc (days)
64. first_obs – Date of first observation used in the orbit fit (UT)
65. last_obs - Date of last observation used in the rmsorbit fit (UT)
66. n_obs_used – Number of observations used in fit
67. n_del_obs_used – Number of Delay-Radar observations used in fit
68. n_dop_obs_used – Number of Doppler-Radar observations used in fit
69. condition_code – orbit condition code (MPC 'U' Parameter)
    - **The orbit condition code**, also known as the U uncertainty parameter, is an integer between 0 and 9 indicating how well an object's orbit is known on a logarithmic scale, where 0 indicates a well-determined orbit.

70. rms – normalized RMS of orbit fit (arcsec)

Blank Fields:

Pdes, Name, Prefix, Neo, Pha, M1, M2, K1, K2, PC, Extent, GM, BV, UB, IR, spec_B, spec_T, H_sigma, diameter_sigma, epoch, epoch_mjd, equinox, e, a, om, w, ma, n, tp, per, moid_ld, moid_jup, t_jup, sigma_e, sigma_a, sigma_q, sigma_i, sigma_om, sigma_w,

sigma_ma, sigma_ad, sigma_n, sigma_tp, sigma_per, class, producer, data_arc, n_del_obs_used, n_dop_obs_used, rms