Analysis and Results

Assumptions/values:

$R_{planet} = R_p = 2.50 \times R_{earth}$

$M_{planet} = 9.70 \times M_{earth}$

$R_{star} = R_s = 0.65 \times R_{sun}$

Mid transit time = 0.46 days

Transit depth (estimated from curve) = td = 0.18%

$M_{star} = 0.73 \times M_{sun} = 1.45153 \times 10^{30}$kg

$G = 6.6743 \times 10^{-11}\ m^3kg^{-1}s^{-2}$

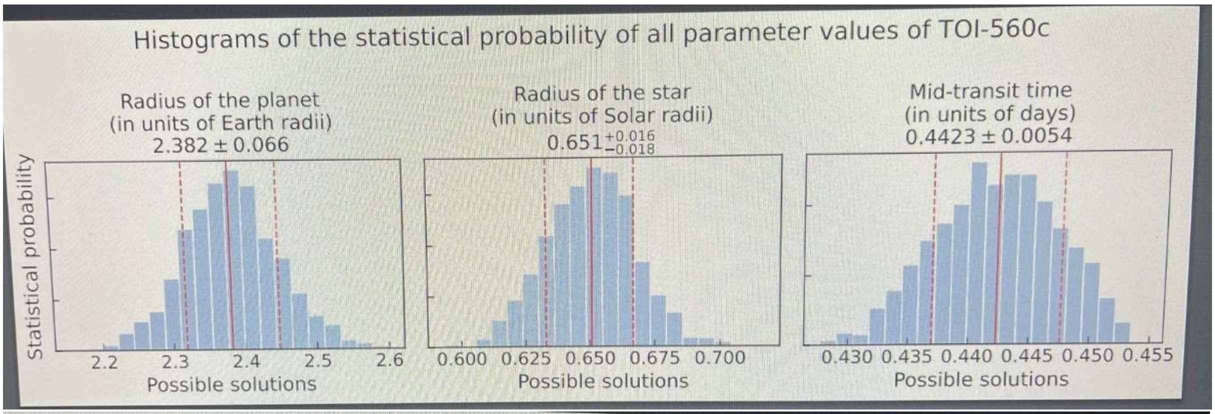
1AE = 149 597 870.7 km

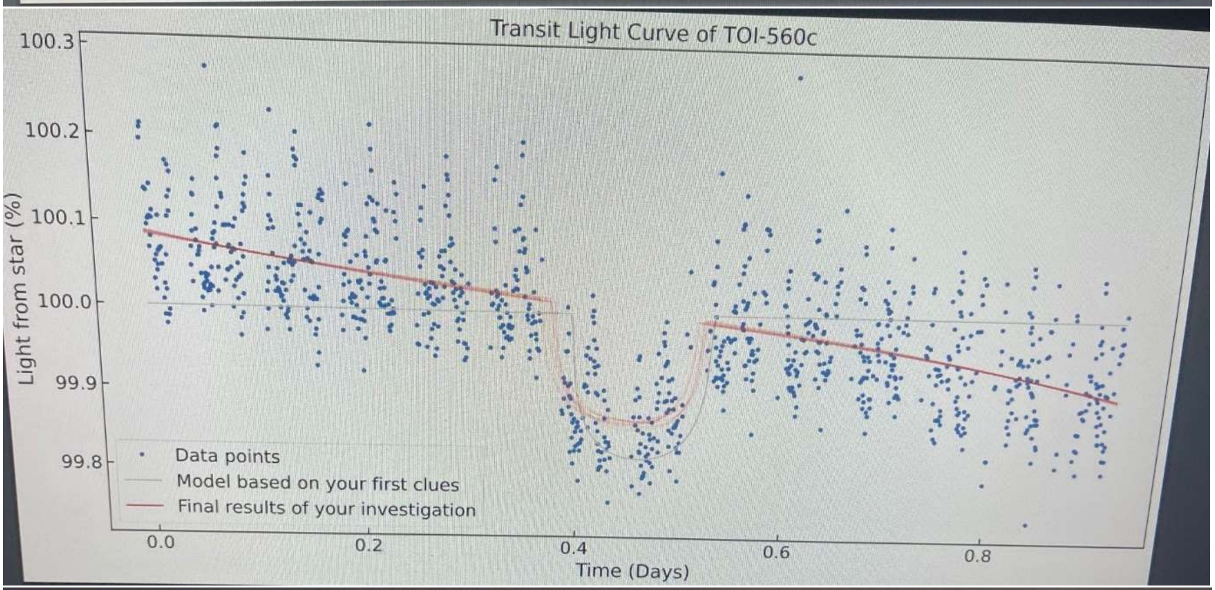
R_{earth} = 6 378 km

R_{sun} = 695700 km

$M_{sun} = 1.9884 \times 10^{30}$ kg

$M_{earth} = 5.9722 \times 10^{24}$kg





Name	Median value	Lower error	Upper error	Case note	Target
Radius of the planet (in units of Earth radii)	2.382	0.064	0.066	Cheops observations	TOI-560c
Radius of the star (in units of Solar radii)	0.651	0.018	0.016	Cheops observations	TOI-560c
Mid-transit time (in units of days)	0.4423	0.0054	0.0053	Cheops observations	TOI-560c
Orbital period (in units of days)	18.8797			Other observations from the archive	TOI-560c
Orbital semi-major axis (in units of AU)	0.1242			Other observations from the archive	TOI-560c

These are the data that were determined through the "allesfitter" program, which used data acquired by CHEOPS using the transit method.

Radius of the planet:

$$td\,[\%] = \frac{\pi \cdot R_P^2}{\pi \cdot R_S^2} \cdot 100$$

$$\hookrightarrow \quad R_P = \sqrt{\frac{td}{100} \cdot R_S^2}$$

$$= \sqrt{\frac{0.18}{100} \cdot (0.65 \cdot R_{SUN})^2}$$

$$= 0.028 \cdot R_{SUN}$$

$$= 0.02758 \cdot 109\, R_{EARTH}$$

$$= 3.0059 \cdot R_{EARTH}$$

$$= 19171.63\ km$$

$$= 1{,}9 \cdot 10^4\ km$$

Orbital period:

$$18.8797\ days =$$

$$= 453.118\ h$$

$$= 1631206.08\ s$$

$$= 1{,}63 \cdot 10^6\ s$$

Orbital distance:

$$T^2 = \left(\frac{4\pi^2}{G \cdot M_{STAR}}\right) \cdot d^3$$

$$\hookrightarrow d = \sqrt[3]{\frac{G \cdot M_{STAR}}{4\pi^2} \cdot T^2}$$

$$= \sqrt[3]{\frac{6.6743 \cdot 10^{-11}\, m^3 kg^{-1} s^{-2} \cdot 1.45153 \cdot 10^{30}\, kg}{4\pi^2} \cdot 1631206.08\, s}$$

$$= 1.8690886 \cdot 10^{10}\, m$$

$$= 18690886\, km$$

in au: $d : 149597870.7$ au

$$= 0.124941\, au$$

Density (by determining the Volume):

$$V_p = \frac{4}{3}\pi \cdot R^3 = \frac{4}{3}\pi \cdot (R_p)^3$$

$$= \frac{4}{3} \cdot \pi \cdot (3.0059 \cdot R_{EARTH})^3$$

$$= 1.6603065 \cdot 10^{13}\, km^3$$

$$\rho = \frac{M}{V} = \frac{M_P}{V_P}$$

$$= \frac{9.70 \cdot M_{EARTH}}{1.6603065 \cdot 10^{13}\ km^3}$$

$$= \frac{9.70 \cdot 5.9722 \cdot 10^{24}\ kg}{1.6603065 \cdot 10^{13}\ km^3}$$

$$= 348913.5\ \frac{kg}{km^3}$$

$$= 3.49 \cdot 10^5\ \frac{kg}{km^3}$$

Converting to g/cm^3:

$$\frac{3.49 \cdot 10^5\ kg}{1\ \ km^3}$$

$$= \frac{3.49 g}{10^7\ cm^3} = 3.49 \cdot 10^{-7}$$
