

While computing geometric parameters of transiting exoplanet systems in TRESKA database, we use simple geometric model of the situation. Derived depth and length of transit is used as input data along with catalogue parameters  $R_s$  [ $R_{\text{sun}}$ ],  $a$  [AU] and  $P$  [days].

### **Exoplanet radius $R_p$**

The exoplanet radius can be computed directly from the following equation

$$\Delta F = \frac{F_* - F_t}{F_*} = \frac{\pi R_*^2 I_* - (\pi R_*^2 I_* - \pi R_p^2 I_*)}{\pi R_*^2 I_*} = \left(\frac{R_p}{R_*}\right)^2 \quad (1)$$

where  $\Delta F$  is depth of the transit,  $F_*$  is total flux of the star OOT,  $F_t$  is flux of the star during the transit,  $R_*$  is star radius,  $R_p$  is planet radius and  $I_*$  is intensity of the star.

### **Inclination angle**

An inclination angle can be computed from derived length of observed transit event  $t_z$ . In general, transit length is given as

$$t_z = \frac{P}{2\pi} \alpha \quad (2)$$

Where  $\alpha$  is a sector on exoplanet orbit, where the planet is transiting in front of the star. Sinus of half of the angle (lets name it  $\beta$ ) is given as

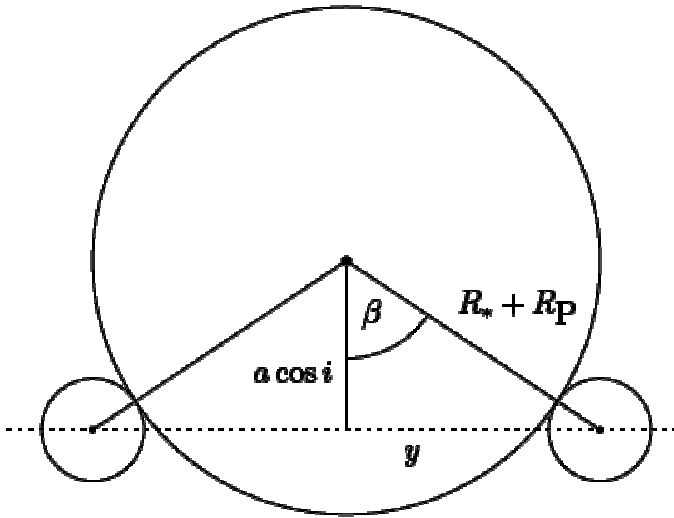
$$\sin \frac{\alpha}{2} = \sin \beta = \frac{y}{a} = \frac{\sqrt{(R_* + R_p)^2 - a^2 \cos^2 i}}{a} \quad (3)$$

The meaning of  $\beta$  angle and all above mentioned quantities is described in pictures 1 and 2. With these pictures, we can derive the following equation

$$t_z = \frac{P}{\pi} \arcsin \left( \frac{\sqrt{(R_* + R_p)^2 - a^2 \cos^2 i}}{a} \right) \quad (4)$$

and after simple algebraical arrangement we get the final equation for inclination angle

$$i = \arccos \sqrt{\frac{(R_* + R_p)^2}{a^2} - \sin^2 \frac{t_z \pi}{P}} \quad (5)$$

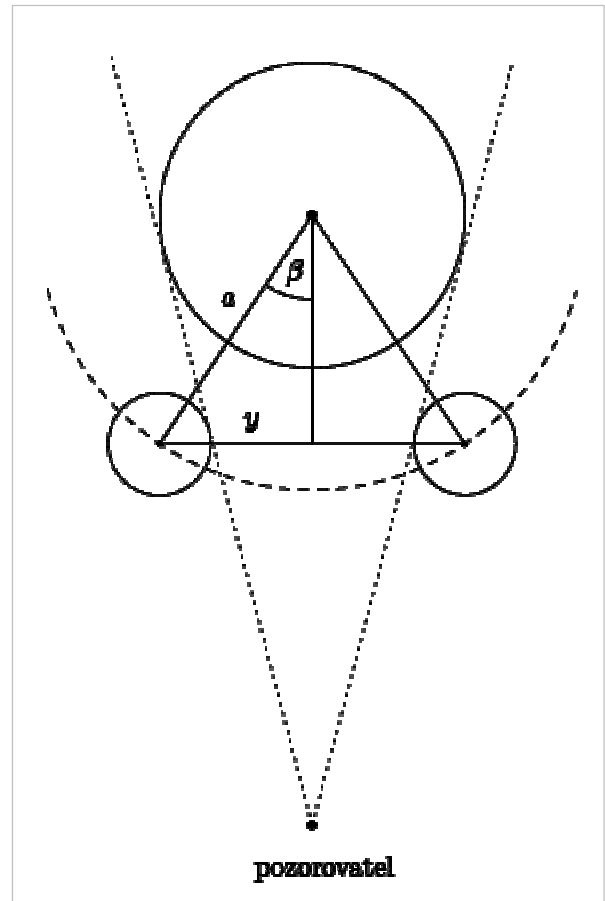


**Picture 1:**  $\beta$  – a half of transiting sector of the planet,  $y$  – temporary quantity,  $a \cos i$  – impact parameter,  $R_p$  – radius of a planet a  $R_s$  – radius of the star. According to Sackett (1999).

**Picture 2:**  $a$  – semi major axis,  $\beta$  – a half of transiting sector of the planet,  $y$  – a temporary quantity.

Uncertainty of planet radius is computed from errors of derived depth of the transit.

Uncertainty of inclination angle is computed from errors of derived length of transit and planet radius along with uncertainties of catalogue values of  $R_s$  and  $a$



#### Reference

- Sackett, P. D. 1999, in NATO ASIC Proc. 532: Planets Outside the Solar System: Theory and Observations, ed. J.-M. Mariotti & D. Alloin, 189
- Disertation of Mgr. Tereza Krejcová, *CCD Photometry of Exoplanets*  
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