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The future of transit photometry in researching exoplanets

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Transit photometry is a method of detecting exoplanets, based on observations of the passage of the planet against the background of the star [1].

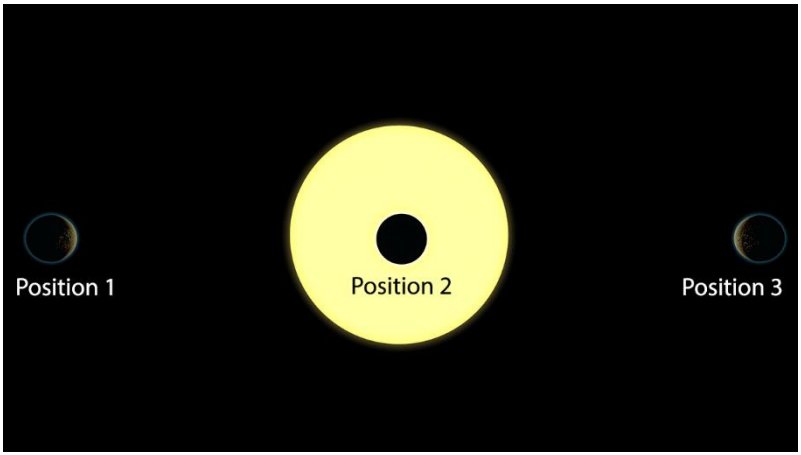

Fig. 1 – Transit method illustration

If a planet crosses in front of its parent star's disk, then a very small drop in the intensity of the light can be observed depending on the sizes of the star and the planet. This method of researching exoplanets is not the new idea. The transit photometry was first shown by the example of the passage of Venus in front of the Solar disk observed by Jeremiah Horrocks in 1639 [1]. But at that time the instruments was not perfect. Today, having all modern inventions, transit photometry is the main method of the researching of

exoplanets. Scientists discovered about a 2700 exoplanets with the help of this method.

Transit photometry is a very efficient method, but very high requirements are set for the photometric measurements, because exoplanets at the moment of transit in the front of its parent star's disks cause a very small drops of star lights.

For example, we have a planet with a radius equivalent to a radius of Jupiter:

$$R_{planet}=R_{jupiter}=0,1R_{sun}$$

And this planet rotates around the star, which has a radius equivalent to a radius of 10 Suns:

$$R_{star}=10R_{sun}$$

Equation for drop of light intensity is presented as follows:

$$\Delta I=(R_{planet}/R_{star})^2$$

Then, drop of light intensity is presented as follows:

$$\Delta I=(0,1R_{sun}/10R_{sun})^2=0,0001$$

This drop of star lights is very small and hard to be detected by the observatory which is situated in Earth therefore scientists are currently using space telescopes for researching and detecting exoplanets. These systems do not depend on most nature interference in observations from Earth, such as distortion of light wave caused by Earth atmosphere [2].

The most famous space telescopes are the Spitzer and James Webb. The existence of about 2600 exoplanets was confirmed using the newest technologies and instruments.

Now, a Spitzer telescope must be described in detail. It was launched in 2003 and now it has a great number of high-tech devices such as infrared array camera, infrared spectrograph and multiband imaging photometer. One of its sections explores how NASA's infrared Spitzer Space Telescope contributes to the study of stars, planet forming disk's, exoplanets. This telescope helps scientist explore

exoplanets that have a very small radius and therefore are not available for researching with the help of Earth telescopes [2].

Now mankind is rapidly developing new technologies because transit method has a wide range of opportunities for the exoplanets research in the future.

References:

1. Mode of access: http://www.spitzer.caltech.edu/. – Date of access: 10.03.2017

2. *NASA Exoplanet Archive.* Retrieved from service of NASA [Electronic resource]. – Mode of access: https://exoplanetarchive.ipac.caltech.edu/. – Date of access: 08.03.2017.