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Corot 310266512 : A Light Curve With Primary, Secondary And Tertiary Eclipses.

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Abstract. We present the photometric study of an interesting target in the CoRoT exoplanet database: CoRoT 310266512. Its light curve shows primary, secondary and tertiary eclipses that suggests the presence of at least three celestial bodies. The primary and secondary eclipses have the same orbital period, 7.42 days, and the tertiary eclipse has an orbital period of 3.27 days. Two of the tertiary eclipses fall within a primary eclipse and a secondary eclipse. The properties of the light curve indicate the presence of two physically separated systems. The primary and secondary eclipses corresponds to a binary system (System I). The tertiary eclipses correspond to a star-planet system or a star-dwarf system (System II). Some parameters of these two systems are obtained from JKTEBOP [1] program.

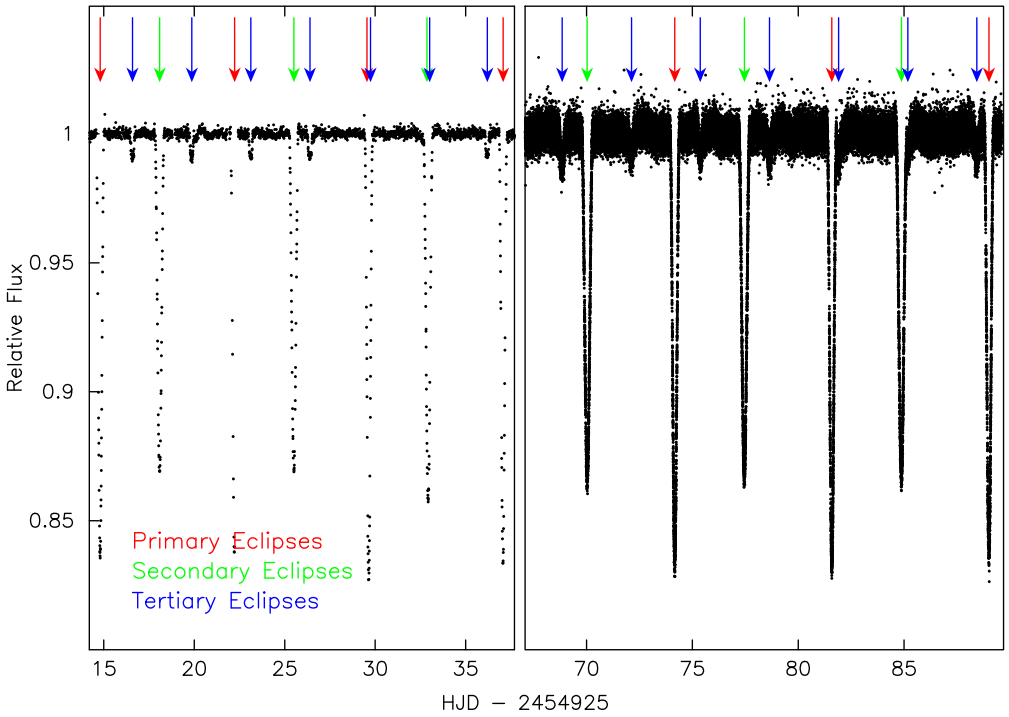

Fig. 1. Part of the light curve with long sampling (left) and short sampling (right).The arrows show the primary (red), secondary (blue) and tertiary (green) eclipses.

1 Data and Properties of Light Curve

CoRoT ID 310266512 has B = 14.87, B-V = 0.8, spectral type of F2 and class V (ExoDat database [2]). The data period (run LRc03) is March 30 – July 2 2009 (totally 95 days), consisting of long (512 seconds) and short (32 seconds) samplings. Important properties of the light curve are as follows:

- The primary and secondary eclipses have the same period 7.42 days, and the tertiary 3.26 days.
- The eclipsing timing variations for all the eclipses are small, less than one minute.
- The durations of the eclipses are of the same order of magnitude.
- The tertiary eclipses have a flat part (transits).
- The depth of the tertiary eclipse is smaller than those of the primary and secondary eclipses by one order of magnitude.

2 Conclusion from Light Curve

- The light curve consists of the sum of the signals from two systems (Systems I and II), physically separated and unresolved in the same field of view.
- System I is an eclipsing binary star.
- System II consists of an planet (or a dwarf star) and a host star.

We fit the light curve using the program JKTEBOP for both systems separately. The results are shown in Table 1.

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Table 1. Values of the computed parameters for the System I and System II.

Parameter	System I	System II
Orbital period [d]	7.421(2)	3.266(6)
Ephemeris timebase [HJD]	2454932.3782(15)	2454931.7931(17)
Eccentricity	0.128(7)	—
Argument of periapse [deg]	133(3)	—
Brightness ratio	0.884(5)	—
Ratio of radii	0.655(8)	0.132(4) – 0.278(6)
Relative radius (A)	0.119(5)	0.033(1) – 0.050(2)
Relative radius (B)	0.078(3)	0.250(3) – 0.180(2)
Orbital inclination angle [deg]	86.2(2)	79.8(2) – 89.8(5)
Third light	0.45(2)	0.55(2) – 0.89(3)

References

1. Southworth, J., Maxted, P. F. L. & Smalley, B., MNRAS **352**, 1277-1289 (2004)
2. Deleuil, M., Meunier, J. C., Moutou, C., Surace, C., Deeg, H. J., Barbieri, M., Debosscher, J . , Almenara, J. M., Agneray, F., Granet, Y., Guterman, P., & Hodgkin, S. Southworth, J., Maxted, P. F. L. & Smalley, B., ApJ **138**, 649-663 (2009)