

# Eclipse Timing Variations Of Planets In P-Type Motion in Binary Star Systems

Poster G01

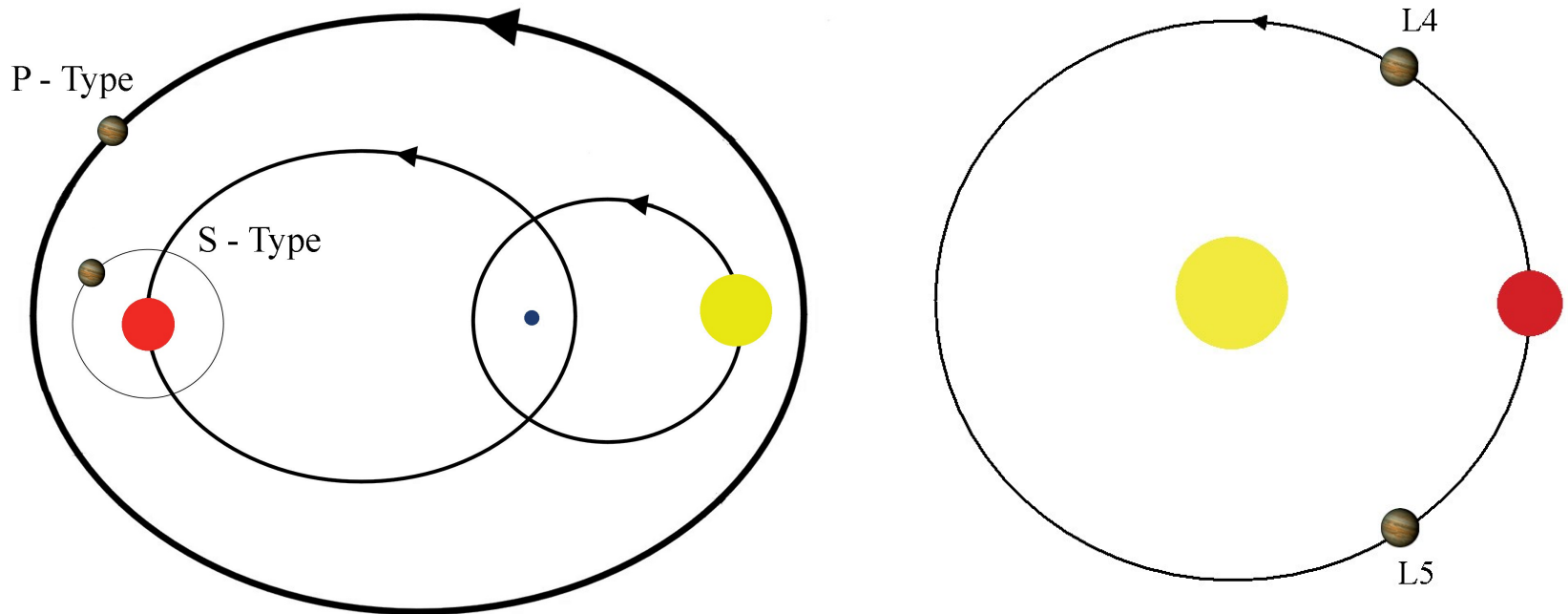
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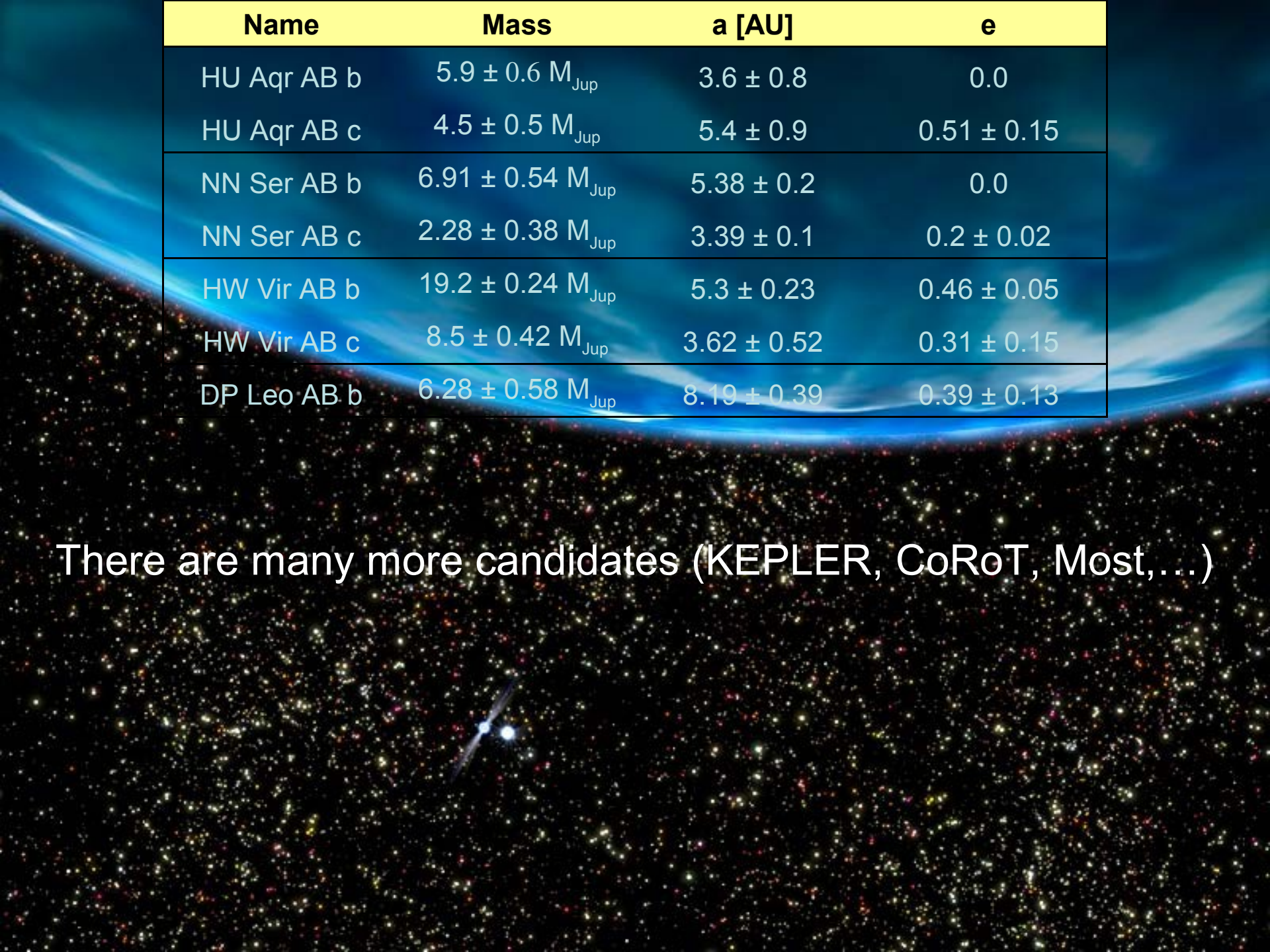
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## In general, one can distinguish three types of stable orbits for planets in binary systems:

- (i) **S-Type**, where the planet orbits one of the two stars,
- (ii) **P-Type**, where the planet orbits the entire binary,
- (iii) **T-Type**, where the planet orbits close to one of the two equilibrium points  $L_4$  and  $L_5$  (Trojan planets)





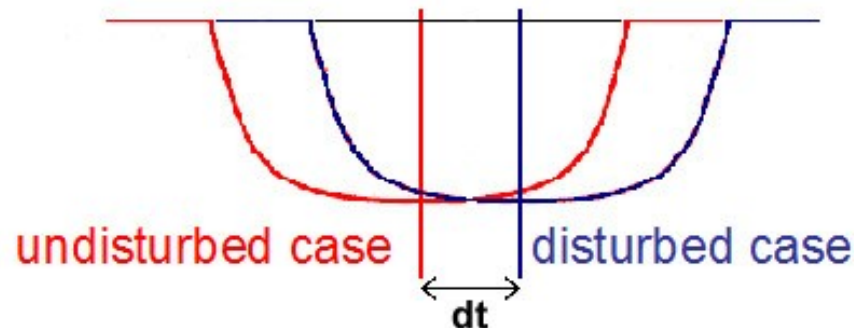
Name	Mass	a [AU]	e
HU Aqr AB b	$5.9 \pm 0.6 M_{\text{Jup}}$	$3.6 \pm 0.8$	0.0
HU Aqr AB c	$4.5 \pm 0.5 M_{\text{Jup}}$	$5.4 \pm 0.9$	$0.51 \pm 0.15$
NN Ser AB b	$6.91 \pm 0.54 M_{\text{Jup}}$	$5.38 \pm 0.2$	0.0
NN Ser AB c	$2.28 \pm 0.38 M_{\text{Jup}}$	$3.39 \pm 0.1$	$0.2 \pm 0.02$
HW Vir AB b	$19.2 \pm 0.24 M_{\text{Jup}}$	$5.3 \pm 0.23$	$0.46 \pm 0.05$
HW Vir AB c	$8.5 \pm 0.42 M_{\text{Jup}}$	$3.62 \pm 0.52$	$0.31 \pm 0.15$
DP Leo AB b	$6.28 \pm 0.58 M_{\text{Jup}}$	$8.19 \pm 0.39$	$0.39 \pm 0.13$

There are many more candidates (KEPLER, CoRoT, Most,...)

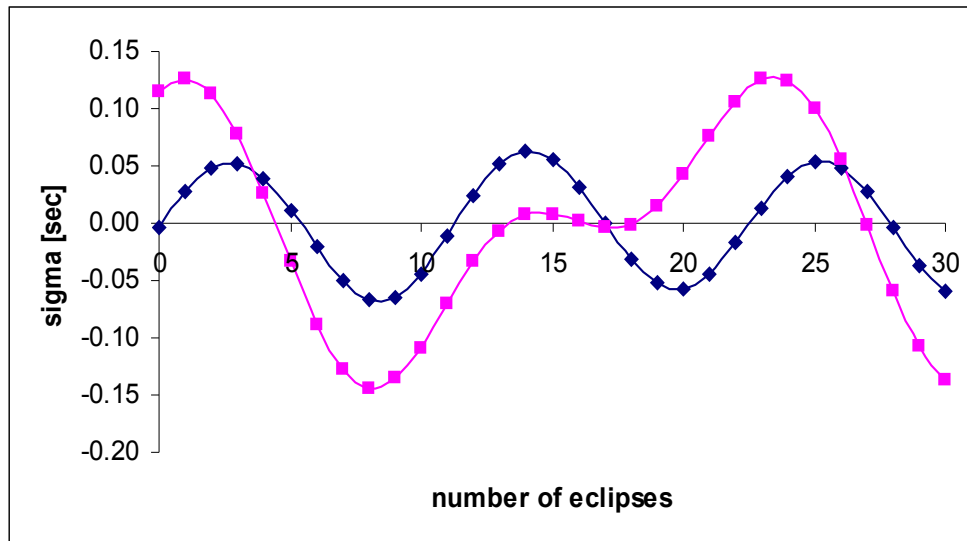
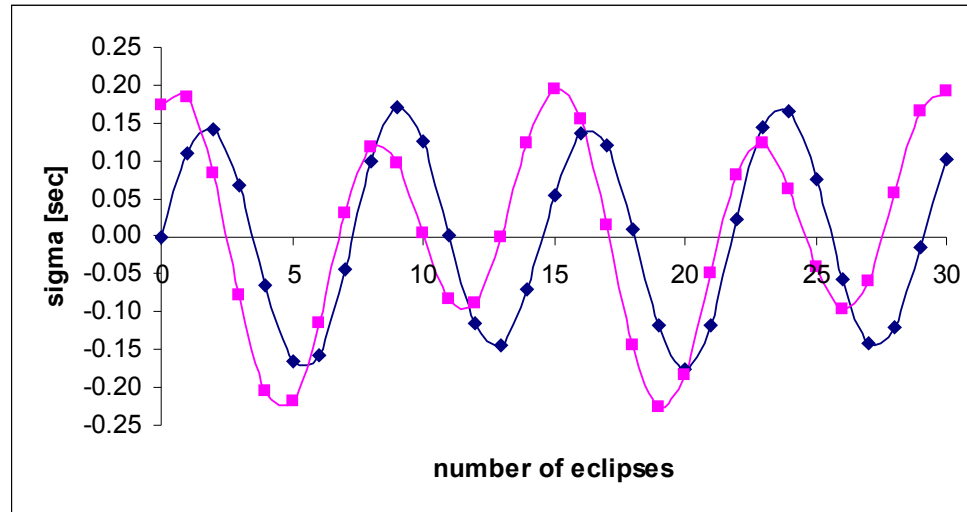
## There are two dynamical effects which changes the ETV signal:

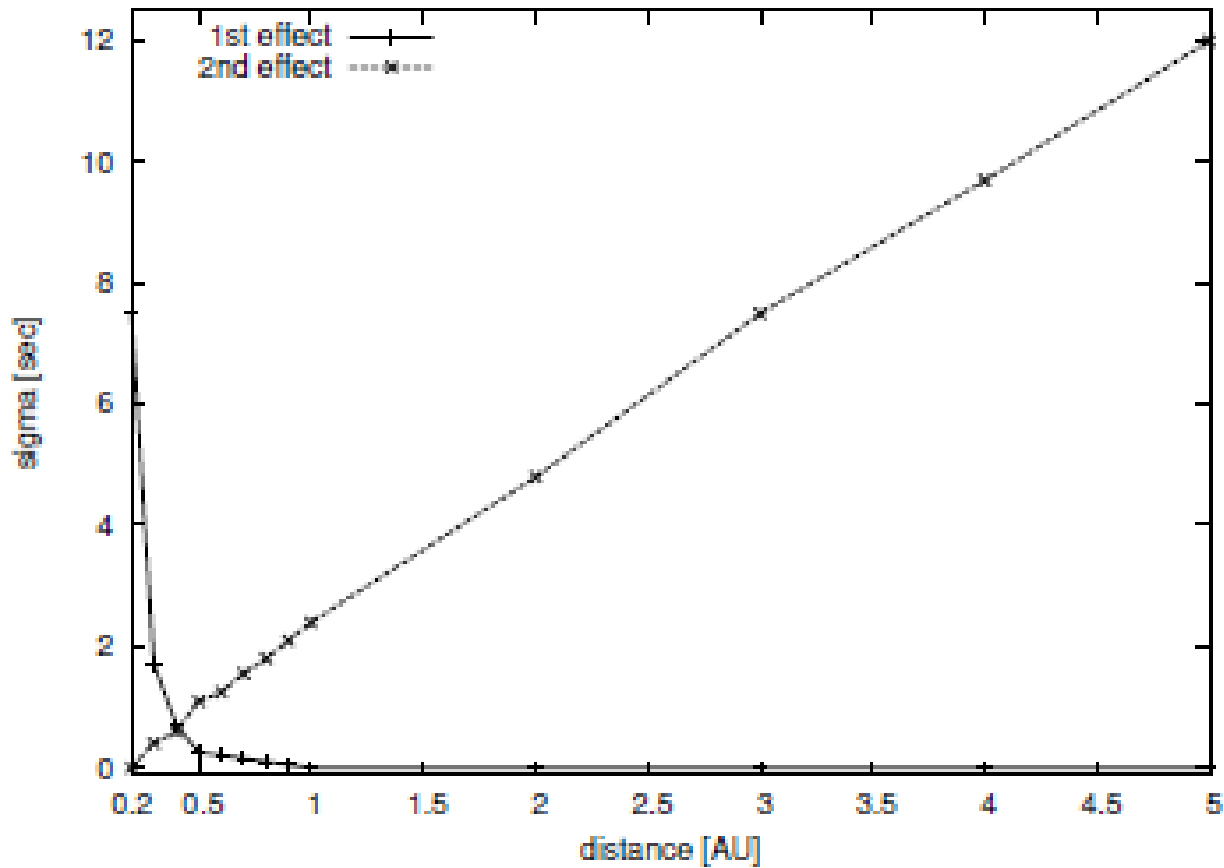
(a) The perturbation of the planet on the orbital motion of the binary. Former investigations showed (Schwarz et al. 2011) that the planets have to be in a circular orbit very close to the secondary star  $a = 0.1\text{AU}$  or in case of planets with larger  $a > 0.1\text{AU}$  they have to be more massive ( $m > 5M_J$ ).

(b) The binary performs also an orbit around the common barycenter, again because of the planets perturbation. This effect leads to different light travel times.



ETV signal for a distance of the planet for  $a=6a_{\text{bin}}$  (left graph) and for a distance of  $a=8a_{\text{bin}}$ . The calculations were done for model 3 and a planet mass of  $1 M_J$ .





Amplitude ( $\sigma$ ) of the ETV signals for planets with  $10 M_J$  for different distances to the binary.