

# A theoretical P-type stable planetary orbit with period equal to half the binary star period

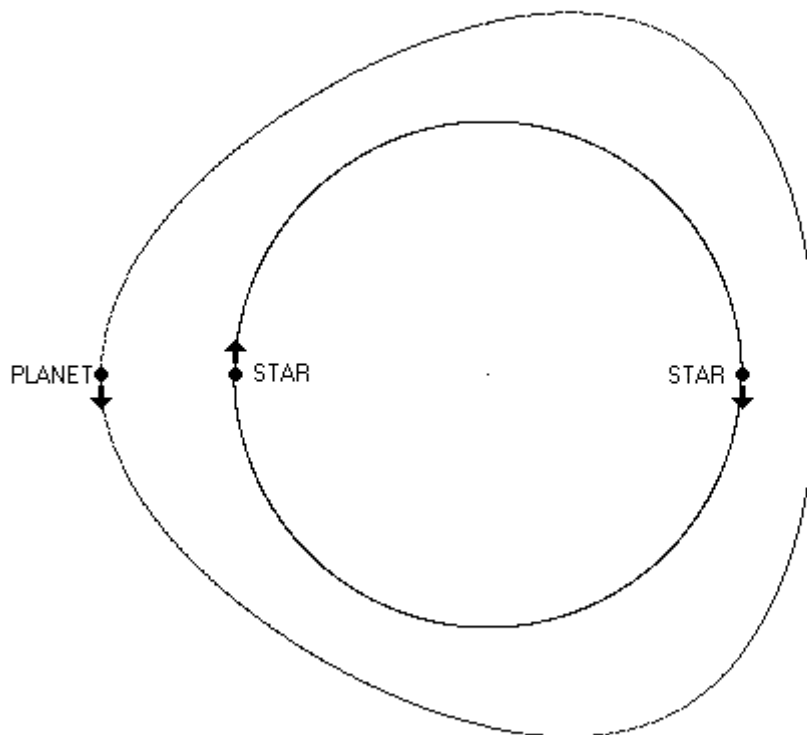
by S Edgeworth 2001, 2012

The two stars have equal mass and their orbit has zero eccentricity. The planet orbits both stars. The planetary orbit is retrograde, and coplanar. The orbital period of the planet is equal to half the orbital period of the star system. The planet completes two orbits for every one orbit of the binary star system.

This theoretical orbit was obtained using n-body software. The orbit is stable. It does not depend on mean mutual resonance; in other words P-type orbits with periods slightly greater than 0.5, or slightly less than 0.5, are equally stable. (The orbit with period=0.5 is simply easier to illustrate because the orbital shape is closed).

The diagram is in the inertial frame (not co-rotated). There is no motion in and out of the page. The planetary orbit and the stellar orbit are coplanar.

**Diagram 1:**



**Initial parameters:**

The starting parameters are given, so that researchers with the appropriate n-body software may reproduce the orbit:

```
[Body1]
Name= StarA
Mass= 0.5 SM
PosX= -0.5 AU
PosY= 0
PosZ= 0
VelX= 0
VelY= (0.5 * 2 * pi) AU/EY
VelZ= 0
```

```
[Body2]
Name= StarB
Mass= 0.5 SM
PosX= 0.5 AU
PosY= 0
PosZ= 0
VelX= 0
VelY= (-0.5 * 2 * pi) AU/EY
VelZ= 0
```

```
[Body3]
Name= Planet
Mass= 0
PosX= -0.760699021 AU
PosY= 0
PosZ= 0
VelX= 0
VelY= (-1.693702523 * 2 * pi) AU/EY
VelZ=0
```

Abbreviations: SM = the mass of our sun. AU = astronomical unit. EY = earth year. pi = 3.14159...

**References**

[www.orbsi.uk/space/simulator/simulator.htm?s=00038](http://www.orbsi.uk/space/simulator/simulator.htm?s=00038)

An HTML5 simulation of this orbit.