Astronomy at Tarleton State University: A study of Eclipsing Binary Star (WY TAU) in the constellation of Taurus the Bull

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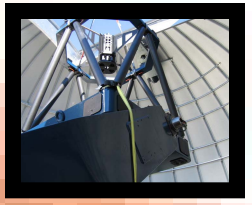


What is a Binary Star

A binary star is a stellar system consisting of two stars which orbit around a common point, called the center of mass. The two stars are gravitationally bound to each other. It has been estimated that more than half of all stars in our galaxy are binary stars. Binary stars play a vital role in our understanding of the evolution and physics of stars. When studied they can provide important data on the mass of each individual star. It is possible to obtain this information only if both spectroscopic and photometric study of the system is performed. Spectroscopic study enables the determination of absolute parameters of the binary system.

Why Study Eclipsing Binary Stars

In order to determine the absolute parameters using spectroscopic techniques, one needs information on the inclination of the orbit. In a binary system the components are so close to each other that they cannot be identified visually. However, since the orbital plane is oriented edge wise to our line of sight, we see the two star as eclipses in the light curve. By studying the light curve through photometric technique one can get information on the inclination of the system.

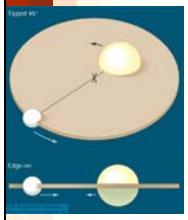
Photometry → ω & i

Spectroscopy → k_1 & k_2

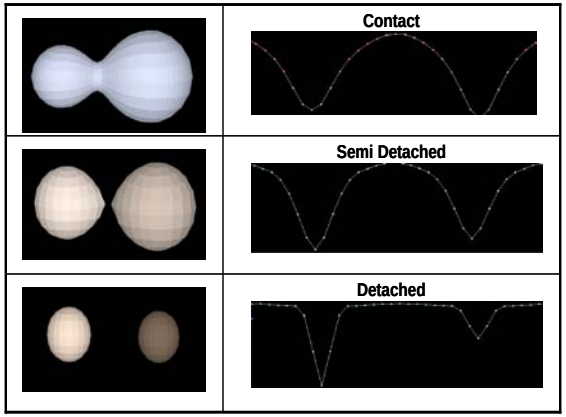
$r = [(k_1+k_2) / \omega] \sin(i)$

$(M_1+M_2) = \omega^2 r^3 / G$

$M_2 / M_1 = k_1 / k_2$



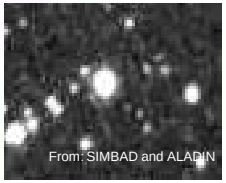
Types of Eclipsing Binary Stars

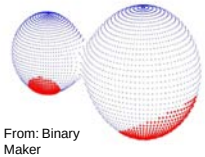


Source: Starlight Pro

WY TAU

WY TAU is a poorly studied eclipsing binary system. Our initial analysis show it to be a contact system.





Ongoing work

As we continue our research we hope to compute a photometric solution using a Wilson-Devinney (mathematical) model.

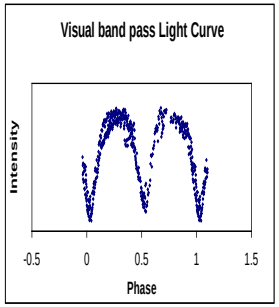
Observation and Analysis

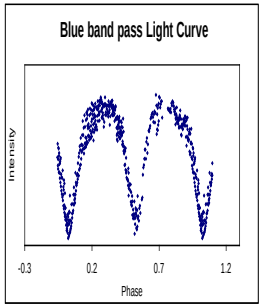
The data on "WY TAU" was gathered in November and December of 2006 using Tarleton State's observatory. 1,008 images were collected over nine nights. The images were taken under two different filters; 507 were taken using a Visual band pass filter and 501 were taken using a Blue band pass filter. Using "Astronomical Image Processing for Windows" software we were able to extract the Julian date and magnitude from the raw images. We then used excel to convert time, or Julian date, into phase and magnitude into intensity. Using the phase and intensity figures we were able to construct the observed light curve. Upon inspection of the light curve we realized the period and epoch needed corrections. Therefore we found the new epoch and period using the middle line method and the regression analysis.

V & B Light Curves

Epoch: 2454084.6100

Period 0.6929794 days





Acknowledgement: This research is funded by Tarleton State University Research Grant