DETECTION OF EXTRASOLAR PLANETS AROUND ECLIPSING BINARIES IN THE KEPLER FIELD

Laurance Doyle
SETI Institute

About 350 eclipsing binary stars may be found in the NASA Kepler Mission field of view (FOV). We have developed two methods for the discovery of planets around eclipsing binaries -- a matching filter to look at quasi-periodic transit features indicative of a planet in transit across the two moving stars in the background, and a second method using timing of the stellar eclipse minima themselves to see if the stars are being offset by giant planets farther out around a binary-planet barycenter. This last method does not require planetary orbits to be in the line-of-sight orbital plane, and non-detections mean that circum-binary planets of a certain minimum mass are not present. One must know the spectral type and luminosity class of the stars for a determination of the size of the planets (transiting) or their projected mass (eclipsing timing). We will use ground-based Stromvil photometry to spectrally classify each eclipsing binary star system, following this with the application of the Wilson-Devinny (WD) eclipsing binary code to determine the exact parameters of the star systems. We have been guaranteed observing time on the 0.9-meter Crossley telescope at Lick Observatory for these observations. We will then apply a well tested matching filter program correlating light curves of the photometric data with generated models of planetary orbits and sizes in order to detect close-in transiting planets at a quantifiable confidence limit. Over a long term we shall then apply the WD code to see if any changes in binary eclipse epochs have shifted in a periodic way, indicative of larger-orbit circum-binary planets. We estimate that hundreds of additional planets may be discovered in the Kepler FOV in this way and that such circum-binary planets will be of significant interest to our understanding of planet formation processes in close binary star systems.