

CHARACTERIZATION OF THE STELLAR POPULATION IN THE KEPLER FIELD: PUTTING KEPLER'S SMALL PLANETS INTO A GALACTIC CONTEXT

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In its extended mission, Kepler focuses on the occurrence rate (η_{Earth}) and physical properties of small planets ($R < 2.5 R_{\text{Earth}}$). To make this historic measurement of η_{Earth} , Kepler observes nearly continuously a rich star field in the Cygnus/Lyra region for photometric transits of planetary companions. The Kepler search field is located 10 degrees off the galactic plane and thus represents a different stellar population than the immediate solar neighborhood. In order to set the population of small Kepler obtained by planets into a Galactic context, we need to characterize the stellar population in the Kepler field. The PI proposes to perform a large-scale spectroscopic survey of the stars in the Kepler field using the wide field Visible Integral-field Replicable Unit Spectrograph (VIRUS) at the Hobby-Eberly Telescope. With VIRUS we have the unique capability to obtain tens of thousands of spectra of Kepler field stars in a very efficient way. VIRUS is an array of Integral-Field-Unit spectrographs with a total of >30,000 fibers and covers a area of 67 square arcminutes in a single 20-minute exposure. The goal of this investigation is to use VIRUS to obtain spectra for more than 50,000 stars, down to 16th magnitude, in the Kepler field. The PI will use the existing tools, that were developed to analyze VIRUS data on a large scale, to determine stellar parameters like effective temperature, metallicity (including alpha-element abundances), surface gravity and radial velocity. With these data, we can determine the underlying stellar context of the planet population that Kepler is finding. We can distinguish between members of the thick- and thin-disk of the Galaxy and even find possible halo stars. As the ultimate goal we can compute η_{Earth} for different stellar populations and use this to extrapolate η_{Earth} to different regions of the Galaxy and the Milky Way as a whole.