

Milky Way photo by Carter Roberts

The *Kepler Mission* Star Field

## The Kepler Mission Star Field

*Kepler* is NASA's first mission capable of finding Earth-size planets in the habitable zone of stars similar to our Sun.

## Selecting the Kepler Star Field

The star field for the *Kepler Mission* was selected based on a number of constraints:

1. The field must be continuously viewable throughout the three and one-half or more years of the mission.
2. The field needs to be rich in stars like our Sun. *Kepler* needs to observe over 100,000 stars all at once.
3. The spacecraft and photometer, with its sunshade, had to fit inside a standard Delta II launch vehicle.

*Kepler* observes near the plane of our Milky Way galaxy where there is a rich star field. To preclude interference from the Sun, *Kepler* needed to point more than 55° away from the path of the Sun in either the northern or southern sky. The Cygnus-Lyra region in the northern sky was chosen, because it is richer in stars than the southern field. Further, the ground-based telescopes needed for *Kepler* follow-up observation are all located in northern latitudes. The selected field is centered on RA=19<sup>h</sup>22<sup>m</sup>40<sup>s</sup> and Dec=+44° 30' 00" (J2000).

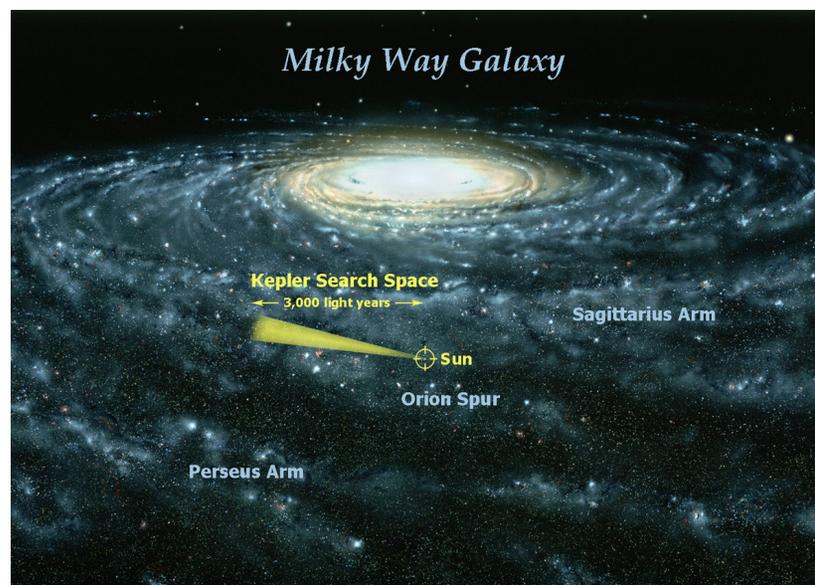
## Locating the Kepler Star Field

The Milky Way photograph (on reverse) shows the *Kepler* field of view. It is located between two of the brightest stars in the sky, Vega and Deneb, which along with Altair form the summer triangle. The three stars of the summer triangle are part of the constellations Cygnus, the swan; Lyra, the harp; and Aquila, the eagle. The field is directly overhead at midnight in late July for mid-northern latitudes. The star field is about 15° across or bigger than your

hand held out at arm's length. This is an enormous field of view compared to that of most astronomical telescopes. The *Hubble Space Telescope* field of view is only about the size of a grain of sand held out at arm's length.

## Distances to the Kepler Stars

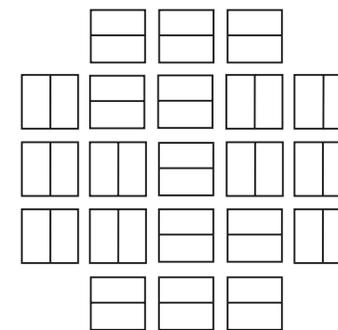
The illustration below shows the shape of our galaxy and the location of our Sun relative to the galactic center. The Sun is about 25,000 light years from the center of the galaxy, about half the distance from the center to the edge. The yellow cone shows the region of the Milky Way that *Kepler* views. *Kepler* looks along a spiral arm of our galaxy. Most of the Sun-like stars in the *Kepler* search space are 600 to 3,000 light years distant. These are the stars where *Kepler* can detect Earth-size planets. Less than 1% of these stars are closer than 600 light years. Stars farther away than 3,000 light years are too faint for *Kepler* to observe the transits needed to detect Earth-size planets.



Region of the Milky Way Galaxy viewed by Kepler.

## What are the Squares on the Kepler Mission Star Field?

*Kepler* measures the light coming from over 100,000 stars using charge-coupled devices (CCDs). The CCDs are similar to those



Layout of the 42 CCDs.

used in consumer digital cameras for taking pictures. However, unlike a digital camera of a few megapixels, *Kepler's* photometer has a total of 95 megapixels. The Milky Way photograph (reverse) shows the orientation on the sky of the detector array of 42 CCDs. Two CCDs form a square module with each of the 21 modules covering about 5 square degrees of the sky. Each CCD is about 3x6 cm in size. The gaps between the CCD modules are the size of the full Moon, ½ degree wide, and the brightest stars fall into the gaps so that *Kepler* can search for the dimmer Sun-like stars. The entire field of view covered by the *Kepler* detector array is more than 100 degrees square.

Learn more by visiting the *Kepler* website  
<http://kepler.nasa.gov>

*Milky Way* images: Amateur astronomer, Carter Roberts, photographed the Milky Way (reverse) and space artist, John Lomberg, painted the Milky Way Galaxy.