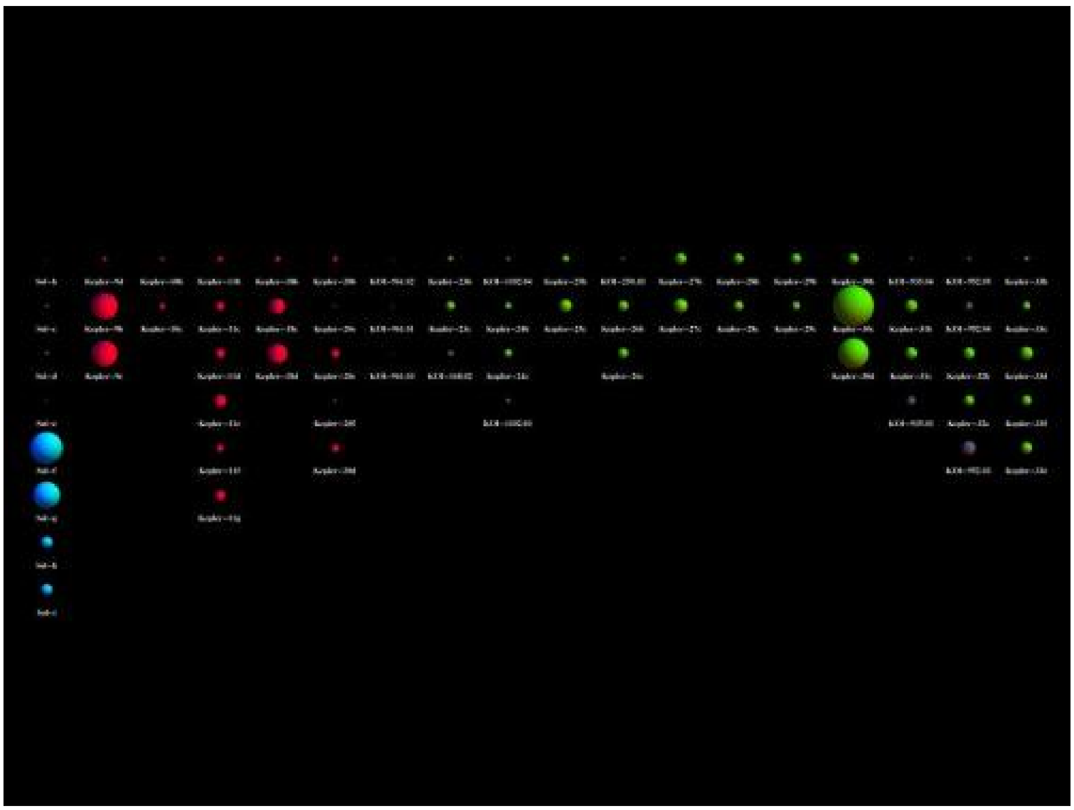
Kepler announces 11 planetary systems hosting 26 planets

January 26 2012



The artist's rendering depicts the multiple planet systems discovered by NASA's Kepler mission. Out of hundreds of candidate planetary systems, scientists had previously verified six systems with multiple transiting planets (denoted here in red). Now, Kepler observations have verified planets (shown here in green) in 11 new planetary systems. Many of these systems contain additional planet candidates that are yet to be verified (shown here in dark purple). For reference, the eight planets of the solar system are shown in blue. Credit: NASA Ames/Jason Steffen, Fermilab Center for Particle Astrophysics

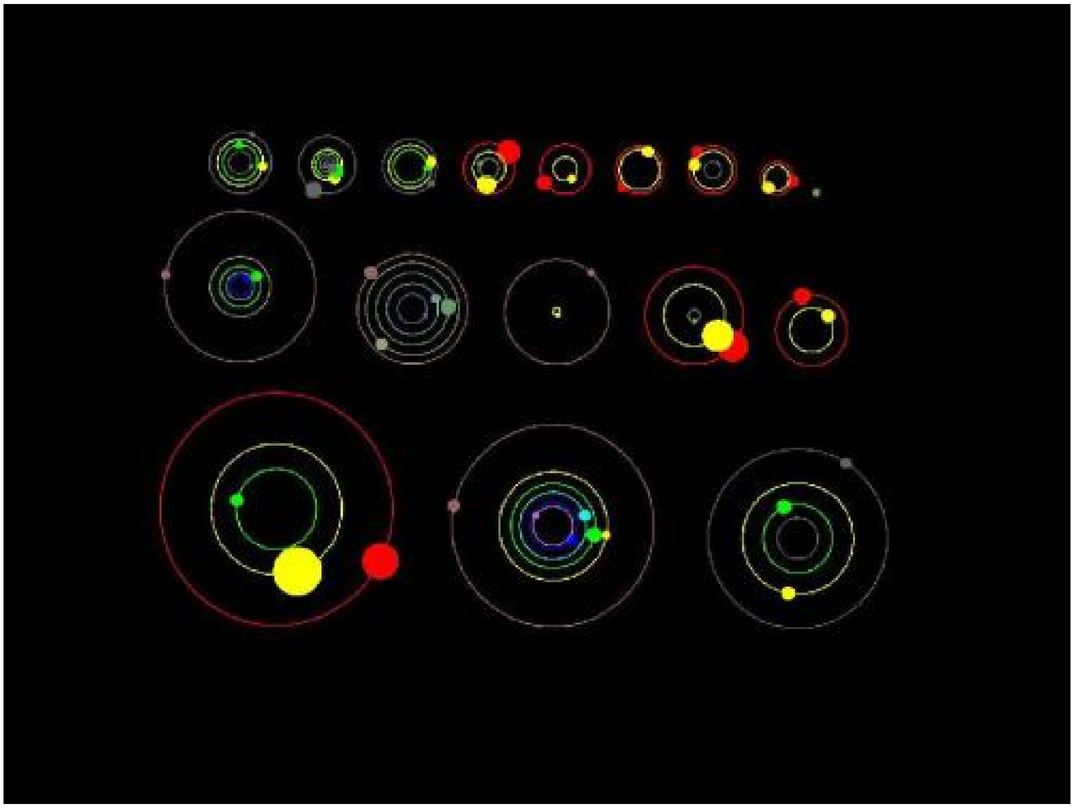
(PhysOrg.com) -- NASA's Kepler mission has discovered 11 new planetary systems hosting 26 confirmed planets. These discoveries nearly double the number of verified Kepler planets and triple the number of stars known to have more than one planet that transits, or passes in front of, its host star. Such systems will help astronomers better understand how planets form.

The planets orbit close to their host stars and range in size from 1.5 times the radius of Earth to larger than Jupiter. Fifteen of them are between Earth and Neptune in size, and further observations will be required to determine which are rocky like Earth and which have thick gaseous atmospheres like Neptune. The planets orbit their host star once every six to 143 days. All are closer to their host star than Venus is to our sun.

"Prior to the Kepler mission, we knew of perhaps 500 exoplanets across the whole sky," said Doug Hudgins, Kepler program scientist at NASA Headquarters in Washington. "Now, in just two years staring at a patch of sky not much bigger than your fist, Kepler has discovered more than 60 planets and more than 2,300 planet candidates. This tells us that our galaxy is positively loaded with planets of all sizes and orbits."

Kepler identifies planet candidates by repeatedly measuring the change in brightness of more than 150,000 stars to detect when a planet passes in front of the star. That passage casts a small shadow toward Earth and the Kepler spacecraft.

“Confirming that the small decrease in the star's brightness is due to a planet requires additional observations and time-consuming analysis," said Eric Ford, associate professor of astronomy at the University of Florida and lead author of the paper confirming Kepler-23 and Kepler-24. “We verified these planets using new techniques that dramatically accelerated their discovery.”



The image shows an overhead view of orbital positions of the planets in systems with multiple transiting planets discovered by NASA's Kepler mission. Credit: NASA Ames/Dan Fabrycky, UC Santa Cruz

Each of the new confirmed planetary systems contains two to five closely spaced transiting planets. In tightly packed planetary systems, the gravitational pull of the planets among themselves causes one planet to accelerate and another planet to decelerate along its orbit. The acceleration causes the orbital period of each planet to change. Kepler detects this effect by measuring the changes, or so-called Transit Timing Variations (TTVs).

Planetary systems with TTVs can be verified without requiring extensive ground-based observations, accelerating confirmation of planet candidates. The TTV detection technique also increases Kepler's ability to confirm planetary systems around fainter and more distant stars.

“By precisely timing when each planet transits its star, Kepler detected the gravitational tug of the planets on each other, clinching the case for ten of the newly announced planetary systems,” said Dan Fabrycky, Hubble Fellow at the University of California, Santa Cruz and lead author for a paper confirming Kepler-29, 30, 31 and 32."

Five of the systems (Kepler-25, Kepler-27, Kepler-30, Kepler-31 and Kepler-33) contain a pair of planets where the inner planet orbits the star twice during each orbit of the outer planet. Four of the systems (Kepler-23, Kepler-24, Kepler-28 and Kepler-32) contain a pairing where the outer planet circles the star twice for every three times the inner planet orbits its star.

“These configurations help to amplify the gravitational interactions between the planets, similar to how my sons kick their legs on a swing at the right time to go higher,” said Jason Steffen, the Brinson postdoctoral fellow at Fermilab Center for Particle Astrophysics in Batavia, Ill., and lead author of a paper confirming Kepler-25, 26, 27 and 28.

The system with the most planets among these discoveries is Kepler-33, a star that is older and more massive than our sun. Kepler-33 hosts five planets, ranging in size from 1.5 to 5 times that of Earth and all located closer to their star than any planet is to the sun.

The properties of a star provide clues for planet detection. The decrease in the star's brightness and duration of a planet transit combined with the properties of its host star present a recognizable signature. When astronomers detect planet candidates that exhibit similar signatures around the same star the likelihood of any of these planet candidates being a false positive is very low.

“The approach that was used to verify the Kepler-33 planets shows that the overall reliability of Kepler's candidate multiple transiting systems is quite high," said Jack Lissauer, planetary scientist at NASA Ames Research Center at Moffett Field, Calif., and lead author of the paper confirming Kepler-33. “This is a validation by multiplicity.”

More information: These discoveries are published in the Astrophysical Journal and the Monthly Notices of the Royal Astronomical Society and can be viewed at:

J Lissauer et al - Almost All of Kepler's Multiple Planet Candidates are Planets, and Kepler-33 5-planet system
E Ford et al - Transit Timing Observations from Kepler: II. Confirmation of Two Multiplanet Systems via a Non-parametric Correlation Analysis. Confirms KOI-168=Kepler-23 and KOI 1102=Kepler-24
J Steffen et al - Transit Timing Observations from Kepler: III. Confirmation of 4 Multiple Planet Systems by a Fourier-Domain Study of Anti-correlated Transit Timing Variations
D Fabrycky et al - Transit Timing Observations From Kepler: IV. Confirmation Of 4 Multiple Planet Systems By Simple Physical Models

Provided by JPL/NASA

Citation: Kepler announces 11 planetary systems hosting 26 planets (2012, January 26) retrieved 19 April 2024 from https://phys.org/news/2012-01-kepler-planetary-hosting-planets.html