New 'hot Jupiter' discovered by Kepler's K2 mission

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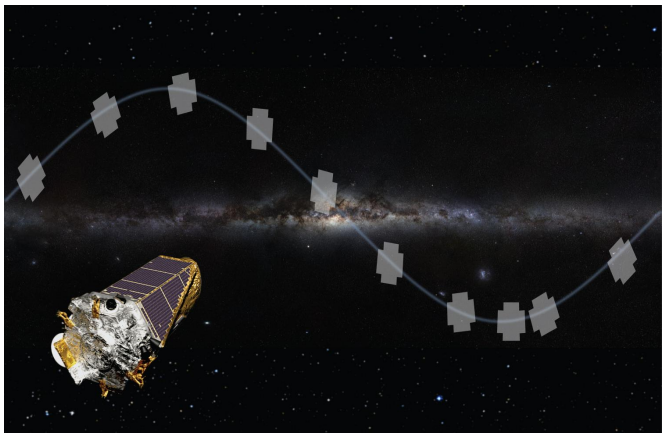

Credit: NASA

(Phys.org)—Despite losing its two reaction wheels, NASA's Kepler spacecraft hasn't stopped amazing the scientific community by detecting new alien worlds. The repurposed Kepler mission, called K2, has recently discovered another new so-called "hot Jupiter" exoplanet, demonstrating once again that it is the most prolific planet-hunting telescope to date. The findings were published on April 10 on arXiv.org.

An international team of astronomers, led by Marshall C. Johnson of the University of Texas at Austin, has used the data from K2's Campaign 4, which lasted from February 7 to April 23, 2015, to search for possible transiting planets. They found two periodic transit-like signals associated with two targets designated EPIC 211089792b (K2-29b) and EPIC 210957318b (K2-30b). While K2-30b was confirmed as a "hot Jupiter" exoplanet during previous observations, K2-29b is a new addition to the long list of Kepler's confirmed extrasolar worlds.

The astronomers also used three different ground-based spectrographs to conduct high-resolution spectroscopic observations of K2-29b, in order to definitely verify it as a "hot Jupiter." The Robert G. Tull Coudé spectrograph, mounted on the 2.7m Harlan J. Smith Telescope at the McDonald Observatory, Texas, allowed the scientists to obtain both reconnaissance spectroscopy and radial velocity measurements. Similar observations were conducted using the Fiber-fed Échelle spectrograph (FIES) on the 2.56m Nordic Optical Telescope at the Observatorio del Roque de los Muchachos, La Palma (Spain) and the HARPS-N spectrograph on the 3.58m Telescopio Nazionale Galileo, also at La Palma.

"Here, we present K2 photometry for two late-type dwarf stars, EPIC 211089792 (K2-29) and EPIC 210957318 (K2-30), for which we identified periodic transit signals, and our follow-up spectroscopic observations. These have allowed us to confirm both transiting objects as bona fide hot Jupiters, and to measure the stellar and planetary parameters," Johnson and his colleagues wrote in a paper.

Hot Jupiters are gas giant planets, similar in characteristics to the solar system's biggest planet, with orbital periods of less than 10 days. They have high surface temperatures as they orbit their parent stars very closely—between 0.015 and 0.5 AU.

While the newly discovered K2-29b exoplanet has a radius that is about the same as Jupiter's, it's less massive (0.6 Jupiter masses) than our solar system's biggest planet. It has an orbital period of 3.26 days and an equilibrium temperature of approximately 800 degrees Celsius, making it a textbook example of a hot Jupiter.

The planet's parent star K2-29 is slightly smaller than our sun, with 0.75 solar radii and 0.86 solar masses. The star is about 2.6 billion years old and is located some 545 light years from the Earth.

The researchers also found that the orbit of K2-29b

is slightly eccentric. This suggests that either the planet migrated to its current location via high-eccentricity migration, or that there is an additional planet in the system exciting the eccentricity.

"In general, eccentric orbits of hot Jupiters might be generated in two different manners: Either the eccentricity is primordial, a relic of high-eccentricity migration that emplaced the planet on a short-period orbit, or the eccentricity is being excited by an external perturber," the paper reads.

However, to investigate these possibilities, future observations using long-term radial velocity and transit timing variation methods are required.

"These possibilities could be distinguished using long-term radial velocity and transit timing variation monitoring to detect an additional companion," the team concluded.

More information: Two Hot Jupiters from K2 Campaign 4, arXiv:1601.07844 [astro-ph.EP] arxiv.org/abs/1601.07844

Abstract
We confirm the planetary nature of two transiting hot Jupiters discovered by the Kepler spacecraft's K2 extended mission in its Campaign 4, using precise radial velocity measurements from FIES@NOT, HARPS-N@TNG, and the coud'e spectrograph on the McDonald Observatory 2.7 m telescope. K2-29 b (EPIC 211089792 b) transits a K1V star with a period of 3.2589263±0.0000015 days; its orbit is slightly eccentric (e=0.084+0.032?0.023). It has a radius of RP=1.000+0.071?0.067 RJ and a mass of MP=0.613+0.027?0.026 MJ. Its host star exhibits significant rotational variability, and we measure a rotation period of Prot=10.777±0.031 days. K2-30 b (EPIC 210957318 b) transits a G6V star with a period of 4.098503±0.000011 days. It has a radius of RP=1.039+0.050?0.051 RJ and a mass of MP=0.579+0.028?0.027 MJ. The star has a low metallicity for a hot Jupiter host, [Fe/H]=?0.15±0.05.

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