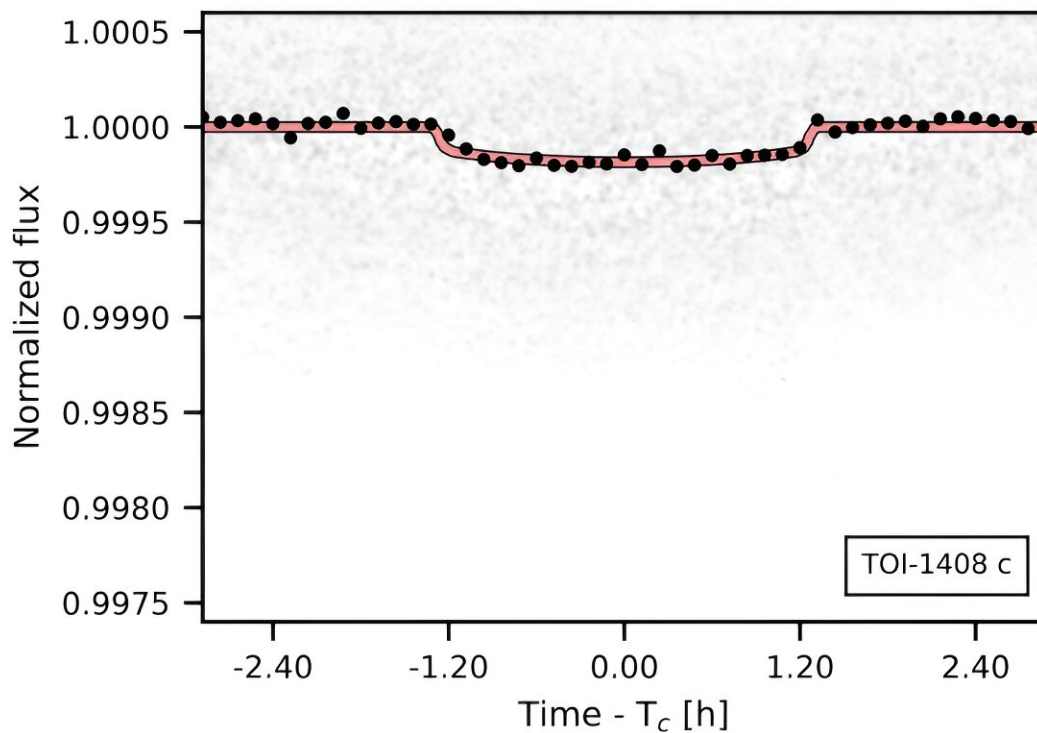


# Additional planet orbiting the star TOI-1408 discovered

July 31 2024, by Tomasz Nowakowski



Photometry from TESS for TOI-1408 c. Credit: Korth et al., 2024.

Using NASA's Transiting Exoplanet Survey Satellite, an international team of astronomers has detected a second planet orbiting a distant main sequence star known as TOI-1408. The newfound alien world,

designated TOI-1408 c, is about two times larger and nearly eight times more massive than the Earth. The finding was reported in a research paper [published](#) July 25 on the pre-print server *arXiv*.

To date, TESS has identified more than 7,200 candidate exoplanets (TESS Objects of Interest, or TOI), of which 543 have been confirmed. Since its launch in April 2018, the satellite has been conducting a survey of about 200,000 of the brightest stars near the sun with the aim of searching for transiting exoplanets—ranging from small, rocky worlds to gaseous giants.

TOI-1408 is a main sequence star of spectral type F8V, located some 453 light years away. It is about 50% larger and 30% more massive than the sun. The star is estimated to be 2.7 billion years old, has an [effective temperature](#) of 6,117 K and its metallicity is at a level of 0.25 dex.

In 2023, a planet was detected orbiting TOI-1408 every 4.42 days. It received the designation TOI-1408 b and follow-up observations have found that the planet is a "hot Jupiter", about 2.4 times larger than Jupiter and with a mass of some 1.86 Jupiter masses.

Now, a group of astronomers led by Judith Korth, of the Lund University in Sweden, reports the TESS discovery of another planet in the TOI-1408 system, interior to the previously known hot Jupiter.

"We report the discovery and characterization of a small planet, TOI-1408 c, interior to a known grazing hot Jupiter, TOI-1408 b, discovered using the Transiting Exoplanet Survey Satellite," the researchers write in the paper.

According to the study, TOI-1408 c is about 2.2 times larger than the Earth and its mass is approximately 7.6 Earth masses, which yields a density at a level of  $3.8 \text{ g/cm}^3$ . The planet orbits the [host star](#) every 2.17

days, at a distance of 0.036 AU from it.

The astronomers underline that the discovery of a small inner planet like TOI-1408 c in such a tight orbit around a hot Jupiter is a rare find. They add that it challenges the typical scenarios suggested for close-in giant planets, highlighting the diverse architecture of exoplanetary systems.

Summing up the results, the authors of the paper note that TOI-1408 may host a third planet. The radial velocity measurements suggest the presence of a long-period outer object in this system. However, further observations, that focus on refining the orbital parameters, are required in order to confirm this.

**More information:** Judith Korth et al, TOI-1408: Discovery and Photodynamical Modeling of a Small Inner Companion to a Hot Jupiter Revealed by TTVs, *arXiv* (2024). [DOI: 10.48550/arxiv.2407.17798](https://doi.org/10.48550/arxiv.2407.17798)

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