The occurrence rate of hot Jupiters from TESS

George Zhou
Retired A-stars have more giant planets

Johnson+ 2010, also see Jones+ 2014
Giant planets from RV

Dwarfs

Evolved

0.5AU

2AU
Kepler

Kepler Planets

$G$ (mag)

$B_p - R_p$ (mag)
TESS FFI (T<10)

126,950 stars
TESS FFI (T<10)

126,950 stars

31 candidates

18 confirmed

3 active

10 False Positives

P < 10 days
Rp > 8 Re

confirmed

candidate

126,950 stars
TESS FFI (T<10)

126,950 stars

WASP, HAT, KELT

* Confirmed Planet
 O Candidate

18 confirmed

126,950 stars
TESS FFI (T<10)

126,950 stars

MIST isochrones
(M/H=0)

Dotter+ 2016
TESS FFI (T<10)

47,126 main sequence stars
TESS FFI (T<10)

- 4 planets, 1 candidate
- 9 planets, 1 candidate
- 4 planets, 1 candidate

47,126 main sequence stars
Completeness of 10 day Jupiters

$B_p - R_p$ (mag)

$G$ (mag)

A 89%  
F 93%  
G 98%  

$2.3M\odot$  
$1.4M\odot$  
$1.05M\odot$  
$0.8M\odot$
TESS HJ Occurrence Rate

Zhou et al. (2019)
TESS HJ Occurrence Rate

![Graph depicting Occurrence Rate vs Stellar Mass (Solar)]

- **G**: 0.8 – 1.05
- **F**: 1.05 – 1.4
- **A**: 1.4 – 2.3

**This Work**: 0.41 ± 0.10%
TESS vs Kepler HJ Occurrence Rate

![Graph showing occurrence rate compared to stellar mass. The graph has bars for three stellar mass categories: G (0.8 - 1.05), F (1.05 - 1.4), and A (1.4 - 2.3). The occurrence rate is given as a percentage.]

Howard+ 12
0.40 ± 0.10%
TESS vs Kepler HJ Occurrence Rate

![Graph showing the occurrence rate of close-in planets as a function of stellar mass. The x-axis represents stellar mass in solar units, and the y-axis represents occurrence rate in percent. The graph shows that the occurrence rate is highest in the 0.8 - 1.05 solar mass range, with a value of 0.43 ± 0.05%.](image-url)
TESS vs RV HJ Occurrence Rate

Occurrence Rate [%]

Stellar Mass (Solar)

0.8 - 1.05 1.05 - 1.4 1.4 - 2.3

Mayor+ 11
0.89 ± 0.36%
Early type stars are rapidly rotating
Doppler tomography

See Donati+ 1997
Collier Cameron+ 2010
TESS HJ rate agrees with Kepler

HJs not more frequent around early-type stars

This Work

$0.41 \pm 0.10\%$

Zhou et al. (2019)
TOI-624
HAT-P-70b

Gravity darkening effect

See Barnes+ 2009

previously detected for Kepler-13
TOI-624
HAT-P-70b

![Graph showing relative flux and residual for TOI-624 and HAT-P-70b with two models: Gravity Darkened Model and Standard Model.](image-url)