TRANSITING EXOPLANET SURVEY SATELLITE
Discovering New Earths and Super-Earths in the Solar Neighborhood

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TESS SCIENCE OBJECTIVES

DISCOVER TRANSITING EXOPLANETS ORBITING NEARBY, BRIGHT STARS

The NASA Kepler Mission showed that planets are abundant throughout the Galaxy, but most of the Kepler planets orbit stars too distant for further study. The NASA TESS Mission will find exoplanets transiting nearby, bright stars: the best targets for followup characterization with large ground telescopes, the Hubble Space Telescope, and the James Webb Space Telescope.

TESS is designed to:
- Monitor 200,000 nearby stars for planets
- Focus on Earth and Super-Earth size planets
- Cover 400X larger sky area than Kepler
- Span stellar spectral types of F5 to M5

TESS observes from unique High Earth Orbit (HEO):
- Unobstructed view for continuous light curves
- Two 13.7 day orbits per observation sector
- Stable 2:1 resonance with Moon’s orbit
- Thermally stable and low-radiation

Each of the four cameras has:
- 24° x 24° Field-of-View
- 100 mm effective pupil diameter
- Lens assembly with 7 optical elements
- Athermal design
- 600nm - 1000nm bandpass
- 16.8 Megapixel, low-noise, low-power, MIT Lincoln Lab CCID-80 detector

TESS telescopes provide photometric precision of 200 ppm in 1 hour on an I=10 star, with systematic noise sources <60 ppm/hr.

TESS MISSION OVERVIEW

ALL-SKY, TWO YEAR PHOTOMETRIC EXOPLANET DISCOVERY MISSION

TESS will tile the sky with 26 observation sectors:
- At least 27 days staring at each 24° x 96° sector
- Brightest 200,000 stars at 2-minute cadence
- Full frame images with 30-minute cadence
- Map Northern hemisphere in first year
- Map Southern hemisphere in second year
- Sectors overlap at ecliptic poles for sensitivity to smaller and longer period planets in JWST Continuous Viewing Zone (CVZ)

TESS 2-Year Sky Coverage Map

TESS SCIENCE INSTRUMENT

FOUR WIDE FIELD-OF-VIEW CCD CAMERAS

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TESS SPACECRAFT

DESIGNED FOR PHOTOMETRIC STABILITY

Orbital ATK LEOStar-2 spacecraft bus:
- 3-axis stabilized pointing, with ≤3 arc-sec performance
- Two-headed star tracker; 4 wheel zero-momentum system
- 400W single-axis articulating solar array
- Passive thermal control
- Mono-propellant propulsion system
- Ka-band 100 Mbps science downlink

The TESS legacy:
A list of the closest transiting planet systems, which will forever be the best targets for followup studies.

For more information, visit http://tess.gsfc.nasa.gov

Principal Investigator: Dr. George R. Ricker, MIT

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TESS data, in combination with follow-up observations enabled by TESS, will allow us to observe a broad range of exoplanets around nearby, bright stars:
- Fundamental properties: mass, radius, orbit
- Dynamics: planet-planet interactions, mutual inclinations, moons, tides
- Atmospheric composition + structure: transmission spectrum, emission spectrum, albedo, phase function, clouds, winds

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