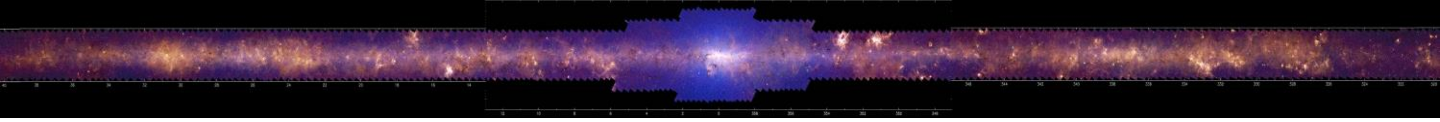

Terahertz Space Telescope:
A Far-Infrared Surveyor of Cosmic Origins and Destiny

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The Terahertz Space Telescope utilizes breakthrough inflatable technology to create a large-aperture far-infrared observing system at a fraction of the cost of previous space telescopes. As a follow-on to JWST, TST will revolutionize our understanding of the origin and evolution of galaxies, stars, and the interstellar medium.

The Far Infrared/Terahertz Regime: Pulling Back the Cosmic Veil

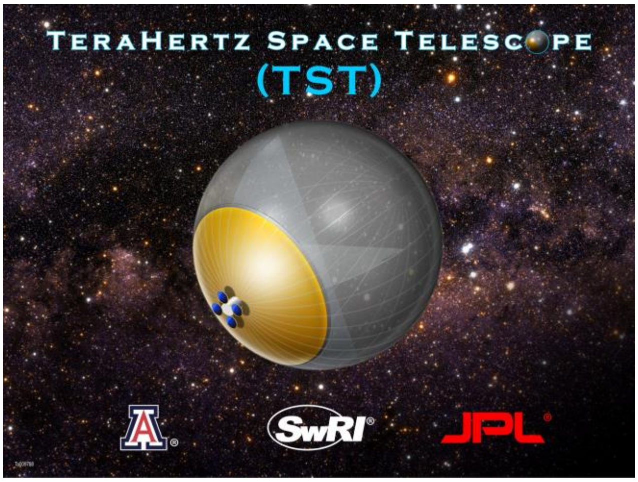
The FIR/THz spectral region holds unique clues to the processes that formed stars and galaxies, and thus is key to answering fundamental astrophysical questions of the origin and destiny of the cosmos. Prior and planned space telescopes have barely scratched the surface of what can be learned in this wavelength region. TST is an affordable 20-30m aperture FIR/THz telescope concept that can explore this regime in unprecedented detail and is an excellent match to the Astrophysics Visionary Roadmap.

TST Science Themes:

- Star formation through cosmic time
- Galaxy formation and evolution: from quasars, Seyferts, and starbursts to the Milky Way
- Life cycle of the interstellar medium
- Galactic ecology
- Astrochemistry
- Formation of solar systems: debris disks, protoplanetary evolution, Kuiper Belt objects, asteroids and comets, planetary atmospheres

Inflatable Technology: Large Aperture at Low Cost

TST will pick up where JWST leaves off: At ~30µm, TST will have >3x the sensitivity and angular resolution of JWST. TST can achieve this at low cost through innovative use of inflatable technology. A recently-completed NIAC Phase II study (Large Balloon Reflector) validated, both analytically and experimentally, the concept of a large spherical reflector integrated into a transparent inflatable structure, and demonstrated all critical telescope functions.



Mission:

Duration: 3-4 years
Orbit: Sun-Earth L2
Launch readiness: 2024
Mission type: Probe-Class; estimated cost < $750M

Spacecraft:

Attitude Control: 3-axis stabilized
Pointing requirements: ~0.1 arcsec
Launch mass: ~600 kg
Launch dimensions: ~2 x 4 m
Max downlink rate: ~10 Mbps, K_a-band

Instrument Module:

Telescope: 20 m inflated, spherical reflector
Frequencies: ~1 to 10 THz (300 to 30 µm)
Angular resolution: ~0.4 to 4 arcsec
Instruments:
Active Spherical Corrector
Coherent & incoherent cameras
  Sensitivity: ~500 K DSB; ~1×10^{-18} watt/Hz$^{1/2}$
  Spectral resolution: ~10^6 to 10^3
Cryogenic system: 2- cryocoolers (4 to 6 K)
Power: ~1 kW, mass: ~225 kg
Heritage: Herschel, SOFIA, STO, LBR