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Proposed L1 Requirements for OST Concept 1

Dave Leisawitz
NASA GSFC

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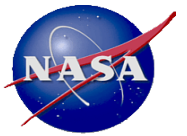
Why L1 Requirements?



- State prioritized science goals in concrete terms, connecting goals to measurements
- Enable traceability from science goals to measurement requirements, instrument parameters, and engineering requirements
- How many L1 requirements for the mission? TBD

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Tied to updated science priorities

1. Heavy element and dust buildup, and galaxy evolution
   i. Measure metal-tracing far-IR fine structure lines from >10^4 galaxies to:
      a) track the cosmic history of heavy element buildup from z = 10 to present-day, and
      b) constrain the star formation rate density and black hole accretion rate density as a function of redshift out to z ~ 7 to determine the connection between black hole growth and star formation over cosmic time.
   ii. Measure 3 – 30 micron rest frame PAH spectral features in at least 100 galaxies in the redshift interval z = 6 to 10 to quantify the dust enrichment history of the universe.
   iii. Observe far-IR molecular and fine structure spectral lines in at least 2000 galaxies to understand feedback mechanisms and learn how galaxies grow and evolve through cosmic time.

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Tied to updated science priorities

2. Use transiting exoplanet spectroscopy in the 6 – 28 micron range to measure biosignatures and find conclusive evidence of the presence or absence of a life signature on at least 10 planets.
3. Characterize protoplanetary disks and their water content
   i. Water in disks – as written, the measurement requirements are incompatible with OST Concept 1. A 14.9 m telescope is needed to satisfy the angular resolution requirement.
   ii. Using HD as a tracer, definitively measure the gas masses of >100 protoplanetary disks to understand how this fundamental parameter varies with stellar age and affects planet formation.
4. Conduct a multi-epoch imaging survey of >1000 square degrees to locate and measure the orbits of outer solar system bodies.
5. Take advantage of the favorable giant planet-to-star contrast ratio in the far-IR to locate and spectrally characterize the atmospheres of gas and ice giant planets in the outer reaches of 100 or more extrasolar planetary systems.

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BACKUP

Tied to demoted science priorities

1. Resolve 100 or more debris disks at >4 beams per disk and use their structure to infer the locations of giant and ice giant planets, leading to an understanding of the formation and migration history of these influential planets.