Objective

- Develop a CubeSat instrument capable of making the critical Total Solar Irradiance (TSI) measurement required for maintaining the long-term earth radiance budget data record. Utilize advancements in ambient-temperature electrical substitution radiometers using new carbon nanotube (CNT) and micromachining techniques to:
  - Provide miniature, low-power absolute detectors for SmallSat implementation.
  - Acquire frequent Earth radiation balance climate measurements with high calibration accuracy.
- Design, build, and test a 6U CubeSat TSI technology demonstration instrument that utilizes ambient-temperature CNT bolometers as the detectors.
- Demonstrate radiometric performance meeting Earth radiation balance requirements — those of solar irradiances — with absolute accuracy goals of <0.01% for TSI and <0.1% for Spectral Solar Irradiance (SSI) tied to SI-references.

Approach

- Characterize CNT coating performance from various deposition methods, and quantify thermal and optical efficiencies specific for ambient temperature space-based operations.
- Design, fabricate, and test miniature CNT-based radiometers applicable for space-based Earth radiation budget measurements.
- Incorporate new NIST micromachining and fabrication processes to integrate radiometer design aspects and improve yield, reduce cost, shorten delivery times, and simplify instrument packaging.
- Leverage CSIM CubeSat design to design and implement a CubeSat technology demonstration of the total solar irradiance instrument.

Key Milestones

- Test radiometer in TSI and Spectral Radiometer Facility 02/18
- Conduct CTIM critical design review 04/18
- Complete CTIM sensor head build 10/18
- Conduct CTIM environmental testing 08/19
- Complete CTIM calibration 02/20
- Complete environmental and performance testing 04/20

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TRL_{In} = 2  \quad TRL_{Current} = 6