



# Prioritized Technology: Low Volume, Low Mass, Low Power Instruments for Small Spacecraft

## Technical Goal

- Develop instruments systems to make measurements with resolution and sensitivity comparable to those made by Discovery class instruments within **< 3 U volume, ~10 W power, and ~5 kg mass.**
- Develop instruments systems to make measurements with resolution and sensitivity comparable to SIMPLEX class D instruments within **< 2 U volume, ~5 W power, and ~3 kg mass.**
- Develop on board data processing capability that enable sufficient science return for small spacecraft
- Develop small electronics and Rad-hard subsystems. that reduce overall instrument volume, mass, and power
- Develop instruments and instrument concepts that benefit from a constellation approach.
- Demonstrate reliability over deep space timescales

## Technical Status/SOA

- Of 100 PSDS3-16 small sat proposals submitted 224 instruments were proposed. All utilized either COTS or commercially available instruments
- New SOA instrument design and build processes can potentially enable achieving the low size, weight, and power technical goals.
- MarCOPlanetary CubeSat - carried only a camera
- Most heritage are from short-lived Low Earth Orbit (LEO) missions for Earth Science/Heliophysics.
- INSPIRE; AOSAT – LEO Meteor observatory; LunaH-Map; Lunar Flashlight; Lunar IceCube; NEAscout.
- DART mission will deploy the LiciaCube CubeSat on arrival at Didymos
- Multiple Space Biology payloads adaptable for life detection. CubeSats (O/OREOS, PharmaSat, EcAMSat, PowerCell, BioSentinel )
- Extensive data on instrument reliability is lacking

## Mission Applications

- The ability to field a large number of inexpensive spacecraft with even 1-2 instruments each could enable new science with significant impact.
- Novel CONOPS may be required to preserve large science return while maintaining low operational costs compared to Discovery-class missions.
- Discovery-class science goals may need to be met through novel implementation of single instrument spacecraft, through multiple low cost SmallSat spacecraft, or multiple missions.