Technology Requirements to Operate at and utilize the Solar Gravity Lens for Exoplanet Imaging

Workshop objectives and agenda
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This KISS Technology Development Workshop is a follow-on to the 2014-15 KISS Study, Science and Enabling Technologies to Explore the Interstellar Medium. Several mission possibilities were identified there, in terms of increasing distance into the interstellar medium: Kuiper Belt Objects, Far Interstellar Medium (>200 AU), and the Solar Gravity Lens Focus (SGLF) Mission (>600 AU).

The interest in the SGLF mission is that it may provide the best, affordable way to achieve kilometer scale images and spatially resolved spectra of resolved features associated with a putative biomass.

This study will provide an opportunity for in-depth discussion in science, instrumentation and mission – which we hope will lead to specific design and technology development proposals to enable this mission to be launched in the mid-2020s.
Objective I: Science

• Potential targets: need to know where to point, rely on other measurements (direct imaging), how accurate should the target position be (orbits?)?

• What can we measure with the SGLT?
  
  • Surface map
  
  • Spectroscopy? Biosignatures?

• Take advantage of spatial resolution to resolve large-scale features (e.g. Oceans, Continents, Mountains, water bodies, large-scale organisms such as plankton)
Objective II: instrument concept

• Flown down from science requirement

• Camera specifications:
  • Solar Coronagraph
  • Imager: wavelength range, detector technology
  • Spectrograph: spectral resolution

• On-board processing

• ...
Objective III: mission concept

- Chemical propulsion options:
- Solar sail requirements
- Multiple spacecraft options for
  - Einstein Ring operations and
    - for communications
- Navigation
- Options for maneuvering: trajectory corrections, focal line flight and Einstein Ring operations
- Communications options: radio, optical, use of relays
- Power options
Objective IV: development roadmap

• Identify technology gaps, coordinate with EXEP

• Draft roadmap

• Advocacy/Funding (NASA, NAS, foundations)

• Synthesis, result dissemination, outreach