Ring Astrometric Field Telescope

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Abstract

The potential benefits of an instrument concept based on an annular field of view for reaching sub-μas astrometry are discussed, and compared to the case of a traditional focal plane imaging a contiguous area close to the telescope optical axis.
The 1 m class telescope is compatible with 4 micron CMOS or 10 micron CCD detectors operating in the visible. Uniform optical response over a large annular strip is expected to significantly alleviate calibration requirements and sensitivity to perturbations. The annular detector can be customized with several photometric bands, and possibly a near IR section.
Since the studied configuration is optimized to perform a complete census of Earth-mass planets in the Habitable Zones (HZs) of F-G-K type stars within 20 pc from the Sun, relative astrometry aspects are assessed in terms of the sky distribution of bright reference stars (G $<=$ 12 mag from Gaia DR3).
The annular field provides typically 4 to 7 more reference stars than a central field, and up to 2 mag brighter. Target characterization is thus sped-up by about one order of magnitude, or conversely many more targets can fit the
operation schedule.
The instrument configuration is adaptable to fit also other key questions in astrophysics: from the shape and dynamics of Dark Matter halos to the measurements of the stochastic background of gravitational waves.

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