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Coronagraph Design Survey for Future Exoplanet Direct Imaging Space Missions

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NASA is embarking on an ambitious program to develop the Habitable Worlds Observatory (HWO) flagship to perform transformational astrophysics, as well as directly image ~25 potentially Earth-like planets and spectroscopically characterize them for signs of life. This mission was recommended by Astro2020, which additionally recommended a new approach for flagship formulation based on increasing the scope and depth of early, pre-phase A trades and technology maturation. A critical capability of the HWO mission is the suppression of starlight. To inform future architecture trades, it is necessary to survey a wide range of candidate technologies, from the relatively mature ones such as the ones described in the LUVOIR and HabEx reports to the relatively new and emerging ones, which may lead to breakthrough performance. In this presentation, we present a brief summary of an effort, funded by NASA's Exoplanet Exoploration Program (ExEP), to survey potential coronagraph options for HWO. In particular, our results consist of: (1) a database of different coronagraph designs sourced from the world-wide coronagraph community that are potentially compatible with HWO; (2) evaluation criteria, such as expected mission yields and feasibility of maturing to TRL 5 before phase A; (3) a unified modeling pipeline that processes the designs from (1) and outputs values for any machine-calculable criteria from (2); (4) assessments of maturity of designs, and other criteria that are not machine-calculable; (5) a table presenting an executive summary of designs and our results. While not charged to down-select or prioritize the different coronagraph designs, the products of this survey were designed to facilitate future HWO trade studies.