

Abstract

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Title: Selection of a Mirror Technology for the 1.8m Terrestrial Planet Finder Demonstrator Mission

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Detection of extra-solar planets should be possible with a telescope that has the required resolution and a coronagraph to block the starlight. The resolution that is needed suggests that the diameter of the primary mirror be at least 6m. For use in space, the mirror would need to be moderately lightweighted with an areal density of roughly 50kg/m² or lower. Most important is the surface quality of the mirror over the spatial frequency range of roughly 10cm to 2m. A ripple in the surface of the mirror, with a spatial scale in this range, would cause starlight to diffract onto the region where a planet may be located. In terms of an rms surface error the mirror would need to be better than 5nm rms in this range. The Terrestrial Planet Finder (TPF) project realized that to demonstrate that a coronagraphic telescope concept could be used for terrestrial planet detection there needs to be a demonstration that a mirror of the required technology could be built. There are several concepts that could be used for designing and fabricating such a mirror but in order to select the most promising technology a survey of the best mirror concepts from the best large mirror builders was needed. This paper describes what was learned from this study and the rationale for the mirror concept that was selected.