Technology Needs for Space-based Cameras and Spectrometers

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The next generation of far-infrared through millimeter space missions will feature cryogenically cooled, large aperture, low background telescopes. To make the most of these observatories, instruments that can image large areas or accept broad spectral coverage will be needed, and these instruments will be designed to achieve the best sensitivity possible, technology permitting. The first capability - large area imaging - will require large format arrays of direct detectors, which is self-evident. In addition, they will require careful optical design to enable the best use of the focal plane real estate, and spectral coverage and/or polarimetry to deliver the science product desired by the community. The second capability - direct detection spectrometers - promises to yield advances in far-infrared spectroscopy limited only by the extremely low natural backgrounds in space. However, the detectors for such an instrument are orders of magnitude more sensitive than any yet produced in this wavelength range, and represent a substantial technological challenge. Survey missions such as proposed Explorer- and Probe-class experiments will begin to tap into these technologies, while future Observatory-class missions such as SAFIR and SPECS would need to use them fully to bring the ultimate promise of this spectral regime.

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