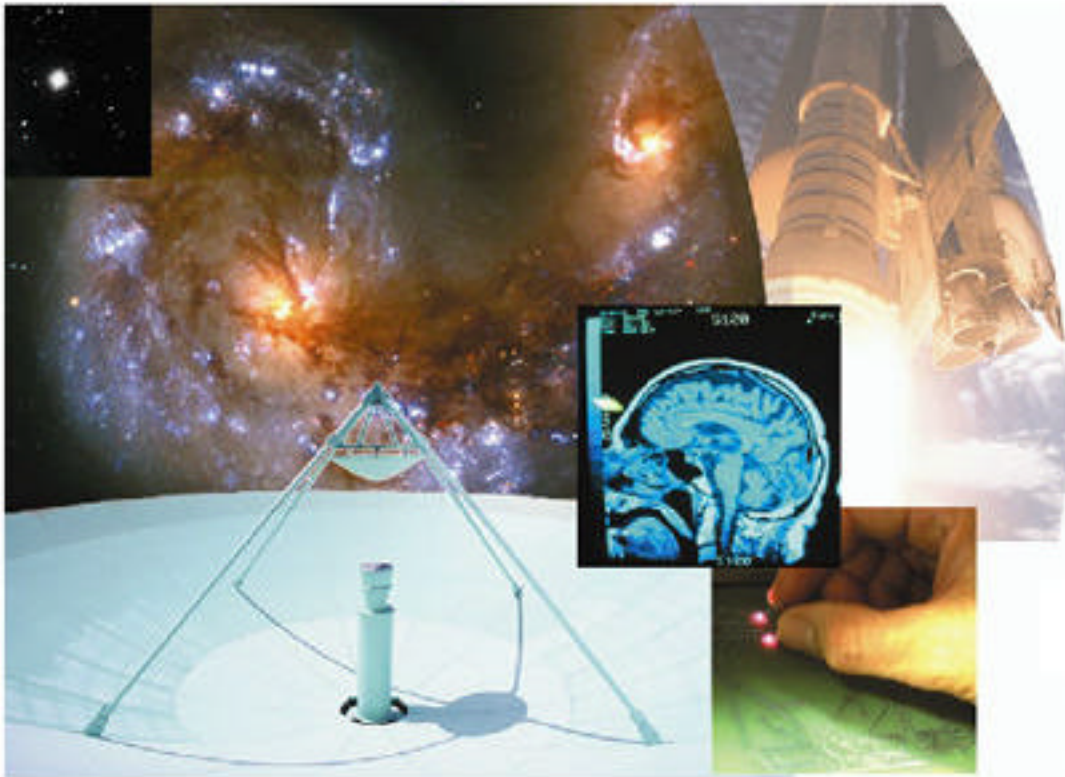


CCD System Technology for Extremely Low Background Observations (GSC-13906-1)

TOP-635



Various CCD Applications

http://tco.gsfc.nasa.gov/tops/ccd_collage.jpg

Objective:

Originally developed at NASA Goddard Space Flight Center for NASA missions, this charge-coupled device (CCD) detector provides improved performance for low-background observations. It advances existing technology by reducing thermal infrared absorption by a factor of five and improving efficiency in the long wavelength (>700 nm) spectral range. NASA offers companies the opportunity to jointly develop or license this innovative CCD detector system.

Description:

Charge-coupled devices have proven to be exceptionally versatile and effective detectors for imaging wavelengths between the near-ultraviolet and the near-infrared portions of the spectrum. Although detector format/size and sensitivity have increased to meet demand, these larger detectors have technical limitations that impede high-sensitivity, low-background observations. For example, cooling the detector to reduce dark current from the bulk silicon is difficult with large formats (e.g., 4096-by-4096 photosensors or pixels) because the large surface absorbs thermal infrared photons from the environment, resulting in a much higher heat load.

NASA Goddard Space Flight Center has devised an innovative CCD detector technology that provides improved performance for low-background observations. NASA's CCD detector system produces a clearer image than existing technology and reduces thermal infrared absorption by a factor of five. Other image improvements stem from increasing efficiency in the long wavelength spectral range (700 nm and toward red).

The technology was originally developed for astronomy applications, but it has potential applicability in other areas. These commercial applications include bioluminescent probe manufacturing, combustion research, diagnostic imaging, and fluorescence microscopy. These applications benefit from the new technology's ability to increase efficiency of a CCD system in low-background (low-photon) environments.

Benefits:

- * **Reduced heat load:** The technology's design reduces the cooling system requirements.
- * **Improved quantum efficiency for 700-950 nm:** This improvement allows the CCD system to detect fainter objects than can be seen with other systems.
- * **Reduced scatter:** The device virtually eliminates the halo of light that can occur when viewing point-like objects, producing a clearer image than possible with existing technology.

Potential Applications:

Originally devised for use aboard NASA missions, including the Hubble Space Telescope, this CCD detector system can be used in many commercial applications:

- * Analytical instrumentation
- * Astronomy
- * Bioluminescent probe manufacturing
- * Combustion research
- * Diagnostic imaging
- * Fluorescence microscopy

Technology Commercialization Status:

This technology is part of NASA's technology transfer program. The program seeks to stimulate commercial use of NASA-developed technologies. A prototype of this technology has been built and undergone some testing, and a patent application has been filed. NASA invites commercial companies to consider partnering with Goddard to develop an application-specific system and pursue commercial applications.

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