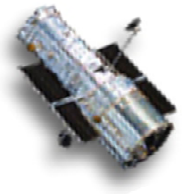
Hubble Facts



HST Program Office

Goddard Space Flight Center
Greenbelt, Maryland 20771

Near Infrared Camera and Multi-Object Spectrometer (NICMOS)

Essentials of the Instrument:

Installed on HST	**Feb. 1997 (SM2)**
Function	**NIR imaging, low-res slitless spectroscopy, coronagraphy, polarimetry**
__ range	**0.8-2.4 _m**
Optical Elements	**Filters, grism(s), polarizers**
Detectors	**256x256 HgCdTe (3)**
Field(s) of View	**11,19,51 arcsec square (cameras 1,2,3 resp.)**
Scale (arcsec/pixel)	**0.043,0.075,0.20 arcsec, resp.**
Enhancement factor over predecessor instrument (if any)	**No predecessor: 1st IR on HST**
Cost	**$136M (FY00$)**
Current status/health	**Operational, improved since launch**

Capabilities of NICMOS

NICMOS is a cooled, internally corrected, near-IR imaging camera which takes advantage of HST's stable optics and dark on-orbit backgrounds to produce filtered imaging with high sensitivity and Strehl ratio, low resolution (R~ 200) multi-object grism spectroscopy, coronagraphy, and polarimetry. The three independent NICMOS cameras offer fields of view ranging from small to medium, and angular resolutions from high to moderate.

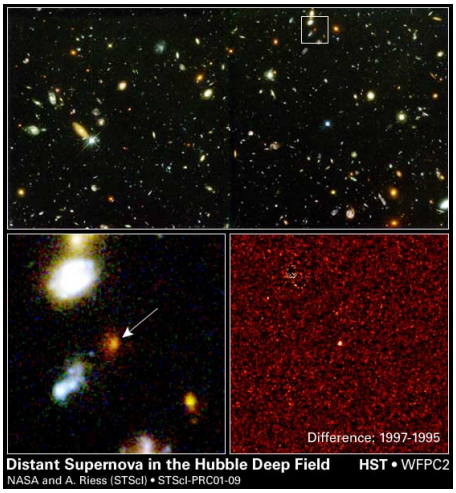
The table below lists limiting fluxes and magnitudes in the three NICMOS cameras through the principal filters for S/N=5. Over the wavelength range 1.1-2.0_m, NICMOS is more sensitive than a ground-based 8m telescope.

Camera	Filter	Bandwidth (microns)	Limiting Sensitivity	
			Jansky	Mag.
NIC1	F110W	0.8-1.35	2.4E-7	24.7
NIC1	F160W	1.4-1.8	5.7E-7	23.2
NIC2	F110W	0.8-1.35	6.3E-8	26.1
NIC2	F160W	1.4-1.8	1.4E-7	24.7
NIC3	F110W	0.8-1.35	4.5E-8	26.5
NIC3	F160W	1.4-1.8	5.8E-8	25.6
NIC3	F240M	2.3-2.5	1.6E-6	21.5

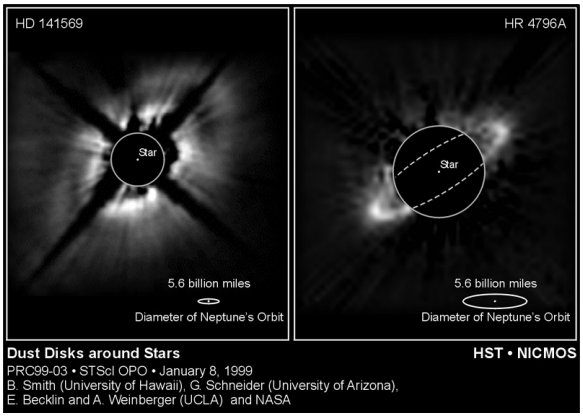
Besides standard imaging: a 0.3 arcsec occulting hole in NIC2's field provides coronagraphy; NIC3 can access three grisms to provide multi-object spectroscopic capability over 0.8-1.2, 1.1-1.9, and 1.4-2.5_m; and three filters with 0/120/240 deg. pass directions can be used for polarimetry over 0.8-1.2_m in NIC1 and 1.9-2.1_m in NIC2.

Science Highlights

Despite a 3+ year hiatus in science operations caused by the premature exhaustion of its solid nitrogen cryogen in January 1999, NICMOS data have been responsible for over 300 refereed papers and a number of critical science discoveries. Most notably, strong supporting evidence that the local universe is undergoing accelerated expansion was provided by WFPC2/NICMOS observations of the z ~ 1.7 Type Ia supernova 1997ff in the northern Hubble Deep Field. NICMOS observations in the near-IR are critical to on-going searches for, and accurate interpretations of, high-z SNIa. The recently completed HST/ACS portion of the GOODS survey revealed many Type Ia SNe, follow-up NICMOS observations of which have resulted in 8 high-z SNIa detections. The mapping of the universe's expansion history continues.



NICMOS has been particularly effective in probing dusty environments such as star-forming regions, and the NIC2 coronagraph has been used to observe possible protoplanetary disk/ring systems around young and intermediate age stars.



NICMOS Status and Prospects

Operations with NICMOS were restored in March, 2002 with the SM3B installation of an advanced, *active* cooling system. A reverse-Brayton cycle cryocooler circulating chilled Ne gas through the cooling loops of NICMOS forms the heart of the NICMOS Cooling System (NCS). Featuring a small turbine spinning at 7000 rps to circulate the gas, the entire system has been running continuously since March, 2002 and has provided stable 77K operation of the three HgCdTe detectors. A bonus of restored operations at this warmer temperature (vs. 58K with the passive N2 ice) is a substantial, wavelength-dependent 30-50% increase in the detectors' quantum efficiencies. NICMOS is better than ever.

With no expendable cryogen to deplete and all other instrumental subsystems in a healthy state, there are no obvious life-limiting threats to NICMOS's future. The near-infrared channel of WFC3 will supplant most of NICMOS' capabilities after SM4.