HST Instrument Capabilities after SM4

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STUC Meeting, October 2006

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Outline

- The instrument complement after SM4
- Summary of instrument modes and capabilities
  - Comparison of similar capabilities
  - Unique capabilities
- Past usage history, and expected usage after SM4
- Suggested levels of support
- Instrument mode prioritization

Instrument Complement after SM4

- COS
  - High sensitivity, moderate & low resolution Far-UV and Near-UV spectroscopy
- WFC3
  - Wide-field Near-UV, Visible, and Near-IR imaging and grism spectroscopy
- ACS
  - Wide-field Visible imaging
  - High-resolution Near-UV and Far-UV imaging
  - Near-UV and Visible Coronagraphy and Polarimetry
- STIS
  - High-resolution Far-UV and Near-UV spectroscopy
  - High-spatial resolution UV and Visible spectroscopy
- NICMOS
  - Thermal-IR imaging (λ>1.8 μm)
  - High-resolution IR imaging
  - IR coronagraphy, polarimetry and grism spectroscopy
- FGS
  - Precision astrometry

Standard Support for HST Instruments

- Calibration
  - Regular monitoring observations
  - Calibration reference files continuously updated
  - Calibration plans updated each cycle
  - Special calibrations done as necessary
- Data Processing
  - Pipeline and off-line software improvements made as needed
  - Develop specialized data reduction and analysis tools
- Documentation
  - Phase I and Phase II proposal instructions
  - User Handbooks, Data Handbooks, Instrument Science Reports
  - Web pages
- User Support
  - Contact scientist program
  - Proposal planning tools (APT, and ETCs)
  - Phase 2 proposal reviews
  - Help desk

Instrument Support Categories

1. **New instrument**
   - Full SMOV activation and calibration of WFC3 and COS.
   - Full characterization and regular calibration of primary WFC3 and COS modes.
2. **Standard support**
   - Unique capabilities
   - Full calibration. Update reference files regularly. Write ISRs on calibration.
   - No SNAPs that require bright-object checking
   - Allocation of resources will generally be based on actual GO usage.
3. **Minimal support**
   - Low usage, secondary or backup modes
   - Minimal expected proposal pressure to use these modes
   - Basic calibration observations.
   - Calibrations checked, but not fully analyzed.
4. **No support** (but available as a shared risk)
   - Secondary, backup, and "available-but-unsupported" modes
   - No SNAPS or ToOs that require bright-object checking.
   - No expected proposal pressure to use these modes
   - If observations proposed, then calibration observations must also be proposed and analyzed by users.

COS Capabilities

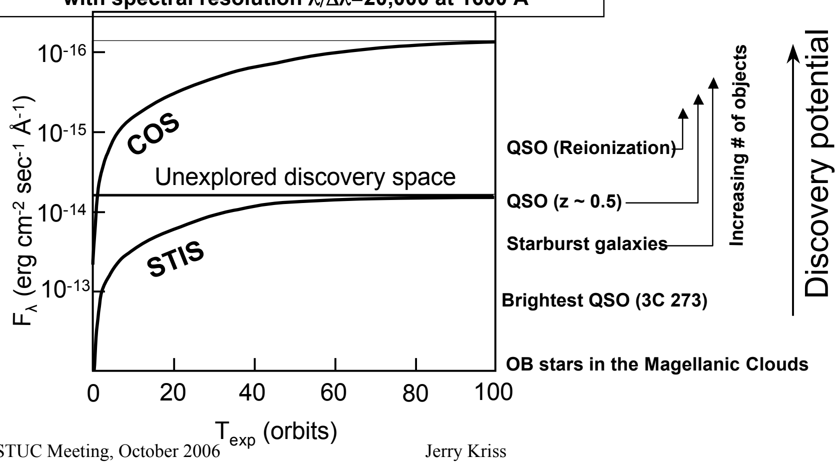
- The Cosmic Origins Spectrograph (COS) is uniquely suited to address particular scientific questions via greatly enhanced low and moderate resolution FUV capabilities for point sources.
- COS exploits an element of "performance space" by providing >10x the FUV throughput of STIS and up to 70x STIS observing speed.
- COS employs an advanced FUV detector with significantly lower backgrounds and routinely utilizes TIME-TAG and event pulse-height recording.

FUV Detector:
- Two 16k x 1k delay line MCPs
- TIME-TAG; pulse-heights
- 3 gratings
- 300-800 Å spectral coverage
- R=3000; 20,000

NUV Detector :
- 1k x 1k MAMA
- TIME-TAG
- 4 gratings, 1 Mirror and filter
- 100-800 Å spectral coverage
- R=2000; 20,000

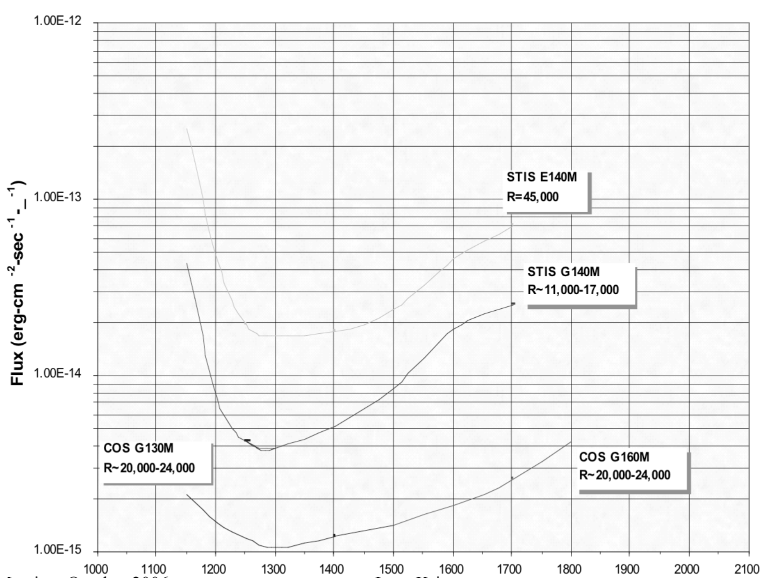
COS Discovery Potential

Limiting flux as function of exposure time to reach S/N=10 with spectral resolution $\lambda/\Delta\lambda$=20,000 at 1600 Å

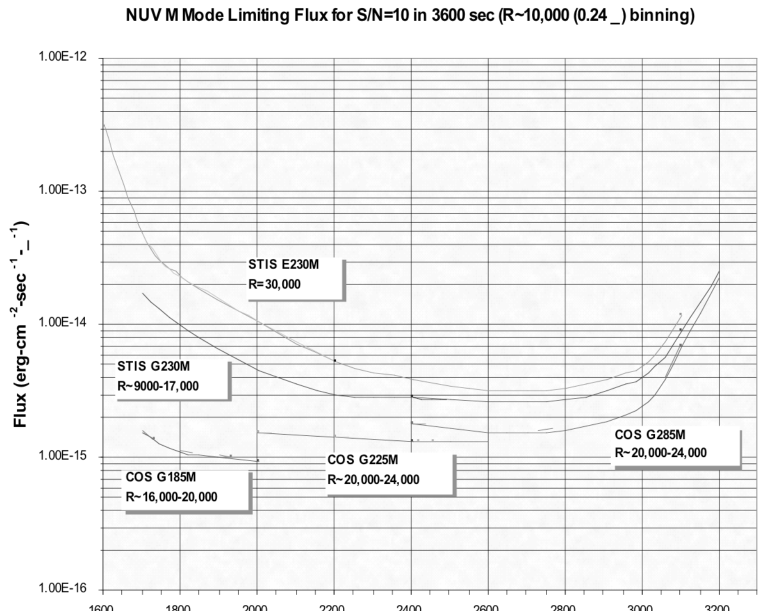


COS FUV Spectroscopic Capabilities

FUV M Mode Limiting Flux for S/N=10 in 3600 sec (R~10,000 (0.15 _) binning)



COS NUV Spectroscopic Capabilities



COS UV Spectroscopic Capabilities

COS vs STIS in the UV

		COS/FUV	COS/NUV	STIS/FUV	STIS/NUV
Spectral coverage (Å)		1150-1775(M) 1230-2050(L)	1700-3200	1150-1700	1600-3200
Effective Area 1300 (FUV), 2500 (NUV)		2800 (M) 2400 (L)	900 (M) 750 (L)	400 (M) 1700 (L)	350 (M) 900 (L)
Resolution ($\lambda/\Delta\lambda$)	H	N/A	N/A	110000	110000
	M	20000-24000	16000-24000	10000-40000	10,000-30000
	L	2400-3500	1500-2800	1000	500
Number of pixels along dispersion		32768	1024	1024 (2048)	1024 (2048)
Background (cts/resel)		4.3e-5	1.9e-3	350e-5	17e-3
Background equivalent F_λ (erg cm^{-2} sec^{-1} Å^{-1})		0.5-8e-18	1.3-3.8e-16	20e-18	13e-16

WFC3 Capabilities

- The Wide Field Camera 3 (WFC3) will provide wide-field imaging with continuous spectral coverage from the ultraviolet through the infrared, and IR grism spectroscopy.
- WFC3 dramatically increases both the survey power and the panchromatic science of HST.
- WFC3 will provide advanced detectors with less radiation damage (hot pixels, charge transfer inefficiency, etc.).

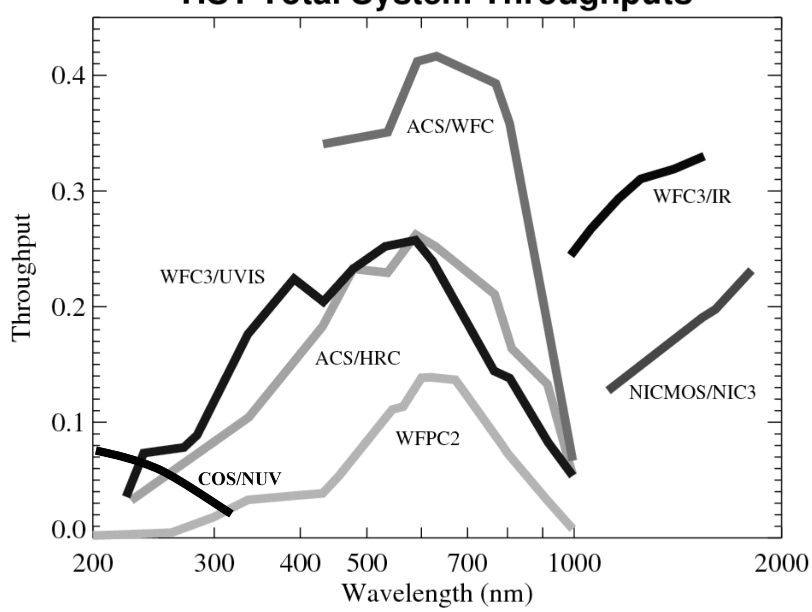
UVIS Channel:

- Two 2k x 4k CCDs
- 160”x160” field of view
- 62 filters, 1 grism
- 200-1000 nm bandpass
- 0.039” pixels

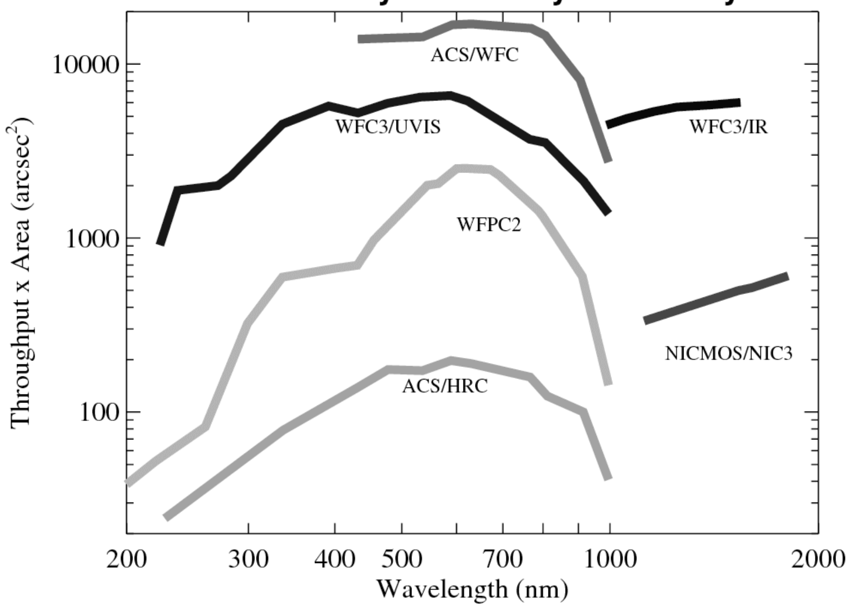
IR Channel:

- 1k x 1k HgCdTe array
- 135”x135” field of view
- 15 filters, 2 grisms
- 800-1700 nm bandpass
- 0.132” pixels

HST Total System Throughputs



HST Survey Discovery Efficiency



WFC3 Capabilities

WFC3 vs ACS in the optical (380 nm - 1000 nm)

	WFC3/UVIS	ACS/WFC	ACS/HRC
FOV area (arcsec^2)	25600	40804	754
Broadband throughput @ *V*, *I*	0.25, 0.14	0.35, 0.36	0.23, 0.16
Pixel scale (arcsec)	0.039	0.049	0.027
Number of pixels	4k x 4k	4k x 4k	1k x 1k
Read noise	3 e^-	5 e^-	4.7 e^-
Number of filters	49 (32 full-field, 17 quad)	27 (12 full-field, 15 ramp)	21* (13 full-field, 3 pol., 5 ramp)

*Some of these cover only the ACS/HRC FOV but can in principle be used in the ACS/WFC.

WFC3 Capabilities

WFC3 / ACS / COS in the near-UV (200 nm - 330 nm)

	WFC3/UVIS	ACS/HRC	COS/NUV
FOV area (arcsec^2)	25600	754	12.5 4.9 (un-vignetted)
Broadband throughput @ 230, 330 nm	0.07, 0.18	0.03, 0.10	0.07, 0.02 (@ 230, 320 nm)
Pixel scale (arcsec)	0.039	0.027	0.024
Number of pixels	4k x 4k	1k x 1k	166 (diameter) 100 (un-vignetted)
Read noise	3 e^-	4.7 e^-	none (dark equiv flux: ~5e-19)
Number of filters	13 (10 full-field, 3 quad)	6 (3 full-field, 3 UV pol.*)	1 (broad-band, 1700-3200 Å.)

*These polarizers are optimized for the UV and the ACS/HRC FOV but can in principle be used with the ACS/WFC in the optical.

WFC3 Capabilities

WFC3 vs NICMOS in the near-IR (800 nm - 2500 nm)

	WFC3/IR	NIC3	NIC2	NIC1
FOV area (arcsec^2)	18225	2621	369	121
Broadband throughput @ 1.1, 1.6 microns	0.29, 0.33	0.13, 0.20	0.14, 0.20	0.12, 0.18
Wavelength Range	0.9-1.7 μm	0.8-2.5 μm	0.8-2.5 μm	0.8-1.8 μm
Pixel scale (arcsec)	0.132	0.200	0.075	0.043
Number of pixels	1k x 1k	256 x 256	256 x 256	256 x 256
Eff. read noise	14	22	20	22
number of filters	15	19 (16 standard, 3 grism)	19 (16 std., 3 pol.)	19 (16 std., 3 pol.)

WFC3 Capabilities

WFC3 UVIS Filters - Broadband

Name	Description	Wavelength (nm) pivot	width	Nearest ACS Equivalent
F200LP	Clear	569	800	-
F218W	ISM feature	218	35	HRC/F220W
F225W	UV Wide	234	55	-
F275W	UV Wide	272	48	HRC/F250W
G280	Grism	278	185	HRC/PR200L
F300X	Extremely wide UV	283	75	-
F336W	*U*, Stromgren *u*	336	55	HRC/F330W
F350LP	Long Pass	681	450	-
F390W	Washington *C*	390	95	-
F438W	WFPC2 *B*	431	68	F435W (WFC & HRC)
F475W	SDSS *g'*	476	149	F475W (WFC & HRC)
F475X	Extremely wide blue	492	220	-
F555W	WFPC2 *V*	531	160	F555W (WFC & HRC)
F600LP	Long Pass	843	400	-
F606W	WFPC2 Wide *V*	591	230	F606W (WFC & HRC)
F625W	SDSS *r'*	625	158	F625W (WFC & HRC)
F775W	SDSS *i'*	773	149	F775W (WFC & HRC)
F814W	WFPC2 Wide *I*	830	254	F814W (WFC & HRC)
F850LP	SDSS *z'*	976	150	F850LP (WFC & HRC)

WFC3 Capabilities

WFC3 UVIS Filters - Medium and Narrow

Name	Description	Wavelength (nm) pivot	width	Nearest ACS Equivalent
F390M	CaII continuum	389	21	-
F410M	Stromgren *v*	411	18	-
F467M	Stromgren *b*	468	22	FR459M (ramp; WFC & HRC)
F547M	Stromgren *y*	544	71	F550M (WFC & HRC)
F621M	11% passband	622	63	WFC/FR647M (ramp)
F689M	11% passband	689	71	-
F763M	11% passband	764	80	-
F845M	11% passband	847	89	-
F280N	MgII 2795,2802	233	3	-
F343N	[NeV] 3426	344	14	HRC/F344N
F373N	[OII] 3726/3729	373	4	FR388N (ramp; WFC & HRC)
F395N	CaII H&K	395	7	-
F469N	HeII 4686	469	4	WFC/FR462N (ramp)
F487N	Hβ 4861	487	5	-
F502N	[OIII] 5007	501	6	F502N (WFC & HRC)
F631N	[OI] 6300	630	4	-
F645N	Continuum	645	9	-
F656N	Hα 6563	656	1	FR656N (ramp; WFC & HRC)
F657N	Wide Hα+[NII]	657	10	-
F658N	[NII] 6583	659	2	F658N (WFC & HRC)
F665N	z (Hα+[NII])	665	11	F660N (WFC & HRC)
F673N	[SII] 6717,6731	676	10	-
F680N	z (Hα+[NII])	688	32	-
F953N	[SIII] 9532	953	8	-

WFC3 Capabilities

WFC3 UVIS Filters - Quad

Name	Description	Wavelength (nm) pivot	width	Nearest ACS Equivalent
FQ232N	CII] 2326	233	3	-
FQ243N	[NeIV] 2425	242	3	-
FQ378N	z ([OII] 3727)	379	9	-
FQ387N	[NeIII] 3869	387	2	-
FQ422M	Continuum	422	11	WFC/FR423N (ramp)
FQ436N	Hγ+[OIII] 4363	437	4	-
FQ437N	[OIII] 4363	437	2	-
FQ492N	z (Hβ)	493	10	-
FQ508N	z ([OIII] 5007)	509	12	FR505N (ramp; WFC & HRC)
FQ575N	[NII] 5755	576	1	WFC/FR601N (ramp)
FQ619N	CH4 6194	620	6	-
FQ634N	6194 continuum	635	7	-
FQ672N	[SII] 6717	672	1	-
FQ674N	[SII] 6731	673	1	-
FQ727N	CH4 7270	727	6	WFC/FR716N (ramp)
FQ750N	7270 continuum	750	7	WFC/FR782N (ramp)
FQ889N	CH4 25/km-agt	889	9	HRC/F892N
FQ906N	CH4 2.5/km-agt	906	9	FR914M (ramp; WFC & HRC)
FQ924N	CH4 0.25/km-agt	925	9	-
FQ937N	CH4 0.025/km-agt	937	9	WFC/FR931N (ramp)

WFC3 Capabilities

WFC3 IR Filters

Name	Description	Wavelength (nm) pivot	width	Nearest NICMOS Equivalent
F098M	Blue grism reference	983	169	NIC1/F090M
G102	Blue grism (high res.)	1025	250	NIC3/G096
F105W	Wide *Y*	1049	292	-
F110W	Wide *YJ*	1141	503	F110W (NIC1, NIC2, & NIC3)
F125W	Wide *J*	1246	302	-
F126N	[FeII]	1258	11	-
F127M	Water/CH4 continuum	1274	69	-
F128N	Paschen β	1283	14	-
F130N	Paschen β continuum	1301	13	-
F132N	Paschen β redshifted	1319	13	-
F139M	Water/CH4 line	1384	65	NIC1/F145M
F140W	JH gap	1392	399	NIC3/F150W & NIC1/F140W
G141	Red grism (low res.)	1410	600	NIC3/G141
F153M	H20 & NH3	1533	69	NIC1/F145M
F160W	Blue-shifted *H*	1541	288	F160W (NIC1, NIC2, & NIC3)
F164N	[FeII]	1645	17	NIC3/F164N & NIC1/F164N
F167N	[FeII] continuum	1667	17	NIC3/F166N & NIC1/F166N

Unique ACS Capabilities

- High-throughput, wide-field Optical imaging
- High-resolution Far-UV, Near-UV and Optical imaging
- UV and Optical Coronagraphy
- UV and Optical Polarimetry

Unique ACS Filters

- G800L -- grism for both WFC and HRC that provides R=100 spectroscopy over 5500-11000A. With the WFC this will continue to provide a quite unique capability with excellent response in the red.
- Ramp filters which cover nearly all of the optical with either 2% or 9% widths and a 70x70" FOV.
  - These are used by the community, but not heavily so.
  - Our calibrations have been minimal, and there is currently a cal-outsourcing program for ramp flats.
  - Many wavelength settings that might be used would be covered by specific WFC3 filters.
- SBC/UV filters have no WFC3 counterparts:
  F122M, F115LP, F125LP, F140LP, F150LP, F165LP
  and PR110L and PR130L.

Unique NICMOS Capabilities

- Thermal IR Imaging at λ>1.8 μm
- IR grism spectroscopy at λ>1.8 μm
- High-resolution IR imaging
- IR Coronagraphy
- IR Polarimetry

Unique NICMOS filters

Name	Description	Wavelength (nm) pivot	width	Nearest WFC3 Equivalent
F090M /NIC1		903	56	F098M Blue grism reference
F095N /NIC1	[S III]	954	4	-
F097N /NIC1	[S III] continuum	972	4	-
F108N /NIC1/3	He I	1082	4	-
F113N /NIC1/3	He I continuum	1130	5	-
F145M /NIC1	Water	1455	59	F139M Water/CH4 & F153M H20 & NH3
F165M /NIC1/2		1648	59	-
F170M /NIC1		1706	60	-
F171M /NIC2		1721	25	-
F175W /NIC3		1750	1100	-
F180M /NIC2	HCO and C2 bands	1797	69	-
F187W /NIC2		1872	245	-
F187N /NIC1/2/3	Pa-alpha	1874	19	-
F190N /NIC1/2/3	Pa-alpha continuum	1900	18	-
F196N /NIC3	[SiVI]	1964	19	-
F200N /NIC3	[SiVI] continuum	1998	21	-
F204M /NIC2	Methane	2035	104	-
F205W /NIC2	Broad K	2074	598	-
F207M /NIC2		2082	152	-
F212N /NIC2/3	H2	2121	21	-
F215N /NIC2/3	H2 continuum	2149	20	-
F216N /NIC2	Brackett gamma	2164	21	-
F222M /NIC2/3	CO continuum	2218	145	-
F237M /NIC2CO		2369	154	-
F240M /NIC3CO band		2396	195	-

(No polarimetry filters listed)

Unique STIS Capabilities

- Echelle modes have higher spectral resolution (up to 200,000 vs 24,000 maximum for COS).
- Long slits can give high-spatial-resolution optical and UV spectra even in crowded fields.
- STIS NUV imaging will have a lower dark rate after SM4 due to additional passive cooling, and it is free of read noise and cosmic rays.
- STIS time-tag has higher resolution (125 μs vs 32 ms for COS).
- STIS can observe objects too bright for COS. (COS ND aperture degrades resolution by 3-5x.)

HST Instrument Usage, Historical & Projected

Detector/Mode	Cycle 14&15	Est. Cycle 17*	Comment
ACS	65%	33%	Wide field, high-res, pol., cor.
NICMOS	26%	4%	High-res, pol., cor., λ>1.8 μm
STIS	23%**	12%	Unique spatial & spectral resolution
FGS	1%	1%	Precision astrometry
COS	---	16%	High UV throughput
WFC3	---	34%	High panchromatic throughput & FOV

**Cycle 12&13 *Biagetti et al. 2003

Imaging Instrument Historical Usage (by Exposure Time*)

Detector/Mode	Cycle 14&15	Est. Cycle 17	Comment
ACS/WFC	51%	26%	WFC3 surveys will be common
ACS/HRC	10%	3%	Will be mostly high-res + Cor.
ACS/SBC	4%	4%	Unique mode
NIC1	2%	1%	Will be mostly high-res
NIC2	9%	1%	Will be mostly high-res
NIC1,2 Polarization	0.4%	0.5%	Unique mode
NIC2 Coronagraphy	1.6%	1.5%	Unique mode
NIC3 (λ<1.8 μm)	14%	0%	Superseded by WFC3
NIC3 (λ>1.8 μm)	0.3%	0.3%	Unique mode
STIS/FUV-IMG	0.2%**	0%	Superseded by ACS/SBC
STIS/NUV-IMG	0.1%**	0%	Superseded by ACS/HRC
STIS/CCD-IMG	0.1%**	0.1%	Mostly Target Acq Verification
FGS	1%	1%	Unique mode & science

**Cycle 12&13.

*GO/GTO/DD programs at Phase 2 ingest.

Spectroscopic Mode Historical Usage (by Exposure Time*)

Detector/Mode	Cycle 12&13	Est. Cycle 17	Comment
ACS/G800L	4%**	4%	Subset of ACS/WFC time
STIS/UV-*L,*M	8%	1%	Spatial resolution is unique
STIS/Echelle *M	6%	3%	R~40,000 is unique
STIS/Echelle *H	3%	3%	R~100,000 is unique
STIS/CCD-*L,*M	6%	5%	Spatial resolution is unique
STIS/NUV-Prism	0.5%	0%	Superseded by SBC & WFC3

**Cycle 14&15.

*GO/GTO/DD programs at Phase 2 ingest.

Projected Usage for WFC3 and COS

Detector/Mode	Est. Cycle 17*	Comment
COS Low Res	2%	Used only for the faintest objects
COS Med Res	14%	Supersedes most STIS UV
WFC3 UVIS	20%	Panchromatic surveys
WFC3 IR	14%	Supersedes NIC3; pan. surveys

*Biagetti et al. 2003

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1. **New instrument**
   - Full SMOV activation and calibration of WFC3 and COS.
   - Full characterization and regular calibration of primary WFC3 and COS modes.
2. **Standard support**
   - Unique capabilities
   - Full calibration. Update reference files regularly. Write ISRs on calibration.
   - No SNAPs that require bright-object checking
   - Allocation of resources will generally be based on actual GO usage.
3. **Minimal support**
   - Low usage, secondary, or backup modes
   - Minimal expected proposal pressure to use these modes
   - Basic calibration observations.
   - Calibrations checked, but not fully analyzed.
4. **No support** (but available as a shared risk)
   - Secondary, backup, and “available-but-unsupported” modes
   - No SNAPS or ToOs that require bright-object checking.
   - No expected proposal pressure to use these modes
   - If observations proposed, then calibration observations must also be proposed and analyzed by users.

Instrument Support Classification

1. **New instrument**
   - COS, WFC3
2. **Standard support**
   - ACS/WFC, ACS/HRC, ACS/SBC (Imaging+Grisms)
   - STIS/E*H, STIS/E*M, STIS/CCD*L,*M
   - *FGS**
3. **Minimal support**
   - STIS/UV*L,*M, STIS/NUV-IMG, *STIS/NUV-Prism*, STIS/COR**
   - NIC1, NIC2, *NIC1,2/POL*, NIC2/COR**, NIC3/(λ>1.8 μm)
4. **No support** (but available)
   - STIS/FUV-IMG, STIS/CCD-IMG

*candidates for outsourcing

Back-up slides follow

STIS after SM4

- STIS NUV dark rate had been about 0.0012 counts/pixel/s; ~ 4X COS dark rate, but …
- STIS MAMAs will get passive cooling added during SM4.
  - Should maintain or even reduce STIS MAMA dark rate, despite expected increase in aft-shroud temperatures.
- Will need to check alignment and calibrations, but expect most calibrations to need only minor adjustments…

STIS Echelle Modes

- In cycle 12 & 13, Echelle H modes 3.2% of initially approved GO expo time; Echelle M modes at 7.1%.
- Expect ~4-5% total usage after SM4.
- E140H and E230H spectral resolution is normally ~110,000, but can be up to 200,000 when using smallest 0.1” × 0.03” aperture.
- E140M (R=45,000) and E230M (R=30,000) resolution modestly better than COS m-modes 16,000 – 24,000.

STIS CCD Spectral Modes

- In Cy 12 & 13 these modes averaged 7.5% of initially approved GO exposure time.
- No bright object constraints
- 0.05” spatial resolution of extended objects
- Only long slit optical spectroscopy on HST
- Aperture bars allow coronagraphic spectroscopy
- Much higher resolution than slitless prisms and grisms available with other HST detectors

STIS 1st Order UV Modes

- In Cy 12 & 13 these modes (G140L, G230L, G140M, G230M) received 10% of expo time.
- Long slits allow 0.025” spatial resolution spectra of extended objects.
- G*M modes have very short per-tilt λ coverage (55 Å G140M, 90 Å for G230M).
- G*L modes used to perform sensitivity monitoring for most MAMA modes, so some calibration must continue.

STIS NUV-PRISM

- Averaged 0.6% of approved GO exposure time in cycles 12 and 13.
- Provides slitless multi-object spectroscopy covering ***both*** NUV & FUV (1150 –3620 Å).
- Throughput smaller than overlapping SBC or HRC prism modes.

STIS Coronagraphic Imaging

- Last used in Cycle 11.
- Suppression of light in PSF wings and PSF stability inferior to HRC coronagraph.
- Only supports unfiltered coronagraphic imaging.
  - Very broad band pass results in large color effects on PSF, making subtraction of standard PSFs difficult
- Narrowest 0.6” wedge position significantly smaller than ACS small spot (1.8“), so may be preferred for imaging very close material.

STIS NUV Imaging

- Only 0.1% of GO exposure time in Cy 12 & 13
- Advantages versus HRC or WFC3 UV modes for observing very faint targets
  - Much lower dark current
  - No read noise
  - Broader filters.
- Disadvantages compared to HRC/WFC3
  - STIS PSF wider and less stable
  - STIS MAMA will often have bright object concerns
  - Narrower filters give HRC/WFC3 smaller color terms

STIS FUV Imaging

- Received 0.3% of exposure time in cy 12 &13
- Less sensitive than comparable SBC modes
- Fewer filter choices than SBC
- Time-tag available for STIS FUV imaging, but not SBC imaging

STIS CCD Imaging

- About 0.9% of exposure time in C12/13. (Mostly target confirmation images.)
- Throughput inferior to broad band WFC3 and ACS/WFC modes.
- Only two very broad and two narrow filters (plus little used ND filters).
- PSF less stable than newer detectors
- Broad filters give large color terms to photometry and PSFs.
- CTI much larger than for newer CCDs

ACS Use (by Exposure Time in Ksec)

Detector	Cycle 15	Cycle 14
ACS Totals	**6144 (55.0%)****	**7310 (66.2%) ****
WFC *	77.6%	76.6%
HRC	11.2%	20.6%
SBC	11.2%	2.8%
WFC SNAPs	9.7%	24.5%
HRC SNAPs	5.5%	17.1%
POL filters	1.1%	1.7%
RAMP filters	0.6%	0
G800L	1.2%	7.2%

GO,GO/DD,GTO - prime and parallel
* Includes 5-10% coord. parallel usage
** Percent of all GO/GTO obs in cycle

NIC Instrument Use (by Exposure Time in Ksec)

Detector/Mode	Cycle 15	Cycle 14
NIC Totals	3239 (29.0 %)**	2194 (19.9%) **
NIC1	10.1%	1.5%
NIC2	42.7%	23.8%
NIC3	47.1%	74.5%
SNAPs	1.0%	0
NIC2/Coron	6.3%	7.7%
NIC1+2/Pol	2.5%	0.7%
NIC3/K-band (>F175W)	2.8%	4.4%

GO,GO/DD,GTO - prime and parallel

**** Percent of all proposed GO/GTO obs**

Relative Usage of Unique NIC Filters
(by Exp Time in Ksec)

Detector/Mode	Cycle 15	Cycle 14
NIC Totals	3239 (29.0 %)**	2194 (19.9%) **
Nic1/F095N	0	0
Nic1/F097N	0	0
Nic1+3/F108N	0.5%	0.1%
Nic1+3/F113N	0	0
Nic1/F145M	0	1.4%
Nic1+2/F165M	0	0
Nic1/F170M	0	1.4%
Nic2/F171M	0	0.1%

GO,GO/DD,GTO - prime and parallel

**** Percent of all proposed GO/GTO obs**

WPC2 Use (by exposure time)

	Cycle 15	Cycle 14
Total WFPC2	**1728 (15.5%) ***	**1344 (12.2%) ***
Primary	3.9%	5.6%
Parallel	96.1%	94.4%
SNAPs	0	0.3%

FGS Use (by exposure time)

	Cycle 15	Cycle 14
Total FGS	**66 (0.5%) ***	**186 (1.7%) ***

GO,GO/DD,GTO - prime and parallel

*** Value in Ksec and given in percent of all proposed GO/GTO obs**

STIS Usage of Unique Modes (by Exp Time)

STIS Mode	Cycle 12+13*
Echelle Hi-res	3.2%
Echelle Med-res	7.1%
CCD/Spectral	7.5%
G140L/M, G230L/M	10.0%
NUV Prism	0.6%
Coron	0
NUV Imaging	0.1%
FUV Imaging	0.3%
CCD Imaging	0.9%

GO,GO/DD,GTO - prime and parallel

Percent of all proposed GO/GTO obs