

GHRIS Cycle 5 Calibration Close-Out

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ABSTRACT

This document summarizes the Cycle 5 calibration program for the GHRIS, both as planned and executed.

1. Summary

The Tables on the next two pages present the GHRIS Cycle 5 Calibration Plan and the actual calibrations carried out. The only difference between the two is that one execution of the CRIMP1 monitoring program was designated as part of the Cycle 6 program, purely a change in nomenclature, not actual result.

Changes to and updates of GHRIS calibration information may be found on the GHRIS web page at STScI:

http://www.stsci.edu/ftp/instrument_news/GHRIS/topghrs.html

GHR5 Cycle 5 Calibration Plan

ID	Proposal Title	Frequency	Estimated Time (orbits)		Required Resources (FTE)	Products	Accuracy	Notes
			“External”	“Internal”				
Routine Monitoring Programs								
6168	PHA/Ion/Threshold Adjustment Tests	1	0	6	0.03	PDB update	N/A	
6169	Echelle Wavelength Monitor	3	9	0	0.12	CDBS	1 diode	
6170	Echelle and G140M Long-Term Monitor	1	6	0	0.03	ISR	2%	
6171	CRIMP1: Integrated Monitoring Program for Side 1	4	4	28	0.16	ISR		
6172	CRIMP2: Integrated Monitoring Program for Side 2	4	12	32	0.16	ISR		
Special Calibration Programs								
6209	G140L Granularity	1	4	0	0.12	ISR, CDBS		
6210	Scattered Light Test	1	4	0	0.06	ISR	2%	
6212	G140M Sensitivity and Vignetting	1	3	0	0.12	ISR, CDBS		
6213	Aperture Offsets	1	16	0	0.06	ISR, CDBS		
TOTAL TIME (including all executions)			58	66	0.86			

GHRS Cycle 5 Calibration Closure

ID	Proposal Title	Time Used (orbits)		Resources Used (FTE)	Products		Accuracy Achieved	Notes	
		“External”	“Internal”		Database	Document			
Routine Monitoring Programs									
6168	PHA/Ion/Threshold Adjustment Tests	0	6	0.03	N/A	TIPS	Nominal	Nominal instrument performance verified at each execution and reported. Final results in close-out documentation STSDAS script for correcting fluxes below 1200 Å	
6169	Echelle Wavelength Monitor	9	0	0.12	N/A	ISR, DH	1 diode rms		
6170	Echelle and G140M Long-Term Monitor	6	0	0.03	sens.	ISR, DH	2%		
6171	CRIMP1: Integrated Monitoring Program for Side 1	3	21	0.30	sens.	ISR, DH	2% sens., 1 diode λ		
6172	CRIMP2: Integrated Monitoring Program for Side 2	12	32	0.30	sens.	ISR, DH	2% sens., 1 diode λ		
Special Calibration Programs									
6209	G140L Granularity	4	0	0.12	CDBS	ISR, DH	1%	completed	
6210	Scattered Light Test	4	0	0.06	PSF	ISR, DH		observations in scheduling	
6212	G140M Sensitivity and Vignetting	3	0	0.12	CDBS	ISR, DH	5% rel.	analysis in progress	
6213	Aperture Offsets	16	0	0.06	CDBS	ISR, DH	TBD	analysis in progress	
TOTAL TIME (including all executions)		57	59	1.14					

6168: GHRS PHA/Ion/Threshold Adjustment Tests—Cycle 5

Plan

Purpose: The purpose of this test is to determine the optimal threshold settings for the GHRS detector diodes.

Description: This internal test performs a pulse height analysis to determine individual diode response as a function of threshold for GHRS detectors 1 and 2. Based on this evaluation new thresholds may be determined for optimal GHRS operation. Also included is one ion test which is a PHA of twice normal threshold to look for ion events (which accelerate back up the 22 kV potential of the tube, liberate electrons from the photocathode, and produce events of twice normal energy (this should be a very low, stable rate)). The final test will determine the optimal, non-standard discriminator thresholds for the few anomalous channels on both detectors. A 15 second flat field observation followed by a 210 second dark count is performed at each of 10 discriminator threshold values for each detector. Cross-talk tables are disabled at the start of this test and re-enabled at the end.

This test will execute once during Cycle 5.

Fraction of GO Programs Supported: This test supports 100% of GHRS observations.

Resources:

Duration (orbits): Internal—6 orbits (3 for each detector).

PI: J. Skapik and S. Hulbert

These data will be reduced by S. Hulbert (0.01 FTE) and L.E. Sherbert (0.02 FTE) and analyzed by J. Skapik. J. Skapik is responsible for making the necessary database updates.

Special Requirements: None.

Accuracy: Verify nominal performance.

Accuracy Requirement:

Products: Command blocks ZCTFLIT1 and ZCTFLIT2 (PLCP threshold files PZTHR1 and PZTHR2) in the PDB will be updated accordingly. All database changes will be made within 2 months of test execution.

Results

Modifications: None.

Execution: Nominal.

Resources Used:

Observation: 6 internal orbits.

Analysis: 0.03.

Accuracy Achieved: Nominal

Products: TIPS. A follow-up visit in February, 1996, set new thresholds and checked them. ISR082 documents this and other detector calibrations.

Time-line: Program executed on 9-1, 9-10, 9-15, and 9-25-95. Results examined by S. Hulbert 10-95.

Continuation Plan: Continued into Cycle 6 as program 6901.

6169: GHRIS Cycle 5 Echelle Wavelength Monitor

Plan

Purpose: The purpose of this test is to determine the dispersion solution for the GHRIS echelle gratings over the full range of wavelengths covered by the echelles.

Description:

This test is an internal test which makes measurements of the Pt-Ne spectral calibration lamp SC2. The spectra obtained are used to calibrate the carousel function, y-deflection function, resolving power sensitivity, and scattered light. This proposal defines the spectral lamp test for both Ech-A and Ech-B.

This test will be executed every 4 months during Cycle 5 for a total of 3 times.

Fraction of GO Programs Supported: This test supports all echelle observations (22% of all GHRIS observations).

Resources:

Duration (orbits): External—9 orbits (3 orbits for both echelles, 3 times in the cycle).

PI: D. Soderblom

Data will be reduced and analyzed by L. E. Sherbert (0.08 FTE) and D. Soderblom (0.04 FTE).

Special Requirements: Some wavelengths are out of the nominally useful range but are used in determining the calibration.

Accuracy:

Accuracy Requirement: 1 diode rms for pipeline calibrated wavelengths.

Products: Results of this program will be described in an ISR. The global wavelength calibration constants will be updated in the CDBS relations, CZCCRCR. Delivery schedule is 2 months after execution.

Results

Modifications: None.

Execution: Nominal.

Resources Used:

Observation: 9 external orbits.

Analysis: 0.12 FTE.

Accuracy Achieved: Nominal

Products: TIPS, DH97. There are no plans to document this program because the analyses of other wavelength monitoring programs (see ISR081) indicate that overall instrument performance is satisfactory.

Time-line: Program executed on 11-18-95, 2-9-96, and 5-7-96 for Ech-A; 11-13-95, 2-11-96, and 5-8-96 for Ech-B. Data examined to verify nominal performance. Results to be incorporated into *Data Handbook* as part of GHRIS operational history.

Continuation Plan: Continued into Cycle 6 as program 6899.

6170: GHRIS Echelle and G140M Long-term Monitor—Cycle 5

Plan

Purpose: The purpose of this program is to monitor the long-term stability (time-scale: 1 year) of the sensitivity of Ech-A, Ech-B, and G140M.

Description: This proposal defines a series of observations that will continue the long-term monitor of Ech-A, G140M, and Ech-B. Ech-A and G140M observations will be made both through the LSA and the SSA. Ech-B observations are through the LSA only. μ Col is used for all observations. For the echelles, OSCAN observations will measure the sensitivity near the blaze peak. The setups for Ech-B are chosen to be the same as those used in SV, to maintain traceability to the original calibrations. WSCAN observations will scan across order 20 in Ech-B. Ech-A is used with an OSCAN at the blaze peak ($m\lambda = 56100$), plus one WSCAN. G140M is used at 1100, 1200, 1300, 1400, 1500, and 1600 Å.

Fraction of GO Programs Supported: All GHRIS programs using Ech-A (11%), Ech-B (11%), and G140M (10%) in Cycle 4, 5, and 6.

Resources:

Duration (orbits): External—6 orbits (3 orbits for Ech-A + G140M, and 3 orbits for Ech-B).

PI: C. Leitherer

The data will be reduced and analyzed by a A. Gonnella (0.02 FTE) and C. Leitherer (0.01 FTE). The reduction and analysis will be completed within 2 weeks of test execution, assuming 50% effort of the TA and 20% of the IS during that time.

Special Requirements: This test should be executed in the middle of Cycle 5 (to within 2 months).

Accuracy: The goal of this program is to monitor and document the long-term behavior of the echelle and G140M sensitivities. The sensitivities found in this program will be compared to previous measurement obtained for the same star and with the same instrument configuration. The relative accuracy will be at least 2%.

Products: The results of the test will be documented in an ISR within 2 months after completion of the program.

Results

Modifications: None.

Execution: Nominal.

Resources Used:

Observation: 6 external orbits.

Analysis: 0.03 FTE.

Accuracy Achieved: Nominal

Products: TIPS, DH97. ISR088 documents the results of this program.

Time-line: Program executed on 2-6-96 and 2-7-96. Data examined to verify nominal performance. Results to be incorporated into *Data Handbook* as part of GHRIS operational history.

Continuation Plan: Continued into Cycle 6 as program 6900.

6171: CRIMP1—Cycle 5 Condensed-Regimen Integrated Monitoring Program for Side 1 of the GHRIS

Plan

Purpose: The purpose of this program is to monitor the sensitivity, wavelength and detector calibrations of Side 1.

Description: 4 times per year, the following observations will be done:

DETECTOR CALIBRATIONS

- 1) dark count measurement
- 2) focus check at nominal high voltage and tweak current
- 3) flat field exposure at center of photocathode
- 4) coarse sample mapping function at central y deflection
- 5) coarse line mapping function at central x deflection

SENSITIVITY MONITORING:

The sensitivity calibration of the GHRIS Side 1 grating G140L will be monitored with the UV spectrophotometric standard star BD+28D4211.

WAVELENGTH MONITORING:

The spectral cal lamp mini-functional test for the first order gratings will be done. It is an internal test which makes measurements of the lamp (SC2). It is used to monitor the carousel function, y deflections, resolving power, and sensitivity. All observations are with the LSA or the SC2 aperture.

Fraction of GO Programs Supported: All GHRIS programs using gratings G140M (10%) and G140L (27%) for wavelengths and sensitivities. The detector calibration part supports Ech-A (11%) in addition to G140L and G140M.

Resources:

Duration (orbits): Internal—28 orbits (7 orbits for each of the 4 executions. Note: the internal orbits are full orbits). External—4 orbits (1 orbit for each of the 4 executions).

PI: D. Soderblom, S. Hulbert, C. Leitherer, A. Schultz

The data will be reduced and analyzed by a technical assistants, L. E. Sherbert (0.08 FTE) and A. Gonnella (0.08 FTE) under the supervision of an Instrument Scientist (0.04 FTE per execution for a total of 0.16 FTE). Individual responsibilities for the IS are: detector calibrations: S. Hulbert; sensitivities: C. Leitherer; wavelengths: D. Soderblom.

Special Requirements: One complete set of observations (detector + sensitivity + wavelengths) should be on one SMS. The detector calibrations themselves should be executed within 24 hours. The 3 repeats should occur every 120 days, to within 10 days.

Accuracy: Relative sensitivities will be measured to better than 2%. Wavelengths should be good to within 1 diode rms.

Products: The results of the test will be discussed in an ISR to be published 2 months after completion of the program.

Results

Modifications: Program ran three times instead of four; last execution made part of Cycle 6 instead.

Execution: Nominal.

Resources Used:

Observation: 21 internal orbits, 3 external orbits.

Analysis: 0.20 FTE.

Accuracy Achieved: Nominal

Products: TIPS, DH97, ISR081 (wavelengths), ISR082 (detector calibrations).

Time-line: Program executed on approximately 9-14-95, 1-1-96, and 5-2-96. Data examined to verify nominal performance. Results to be incorporated into *Data Handbook* as part of GHRIS operational history.

Continuation Plan: Continued into Cycle 6 as program 6897.

6172: CRIMP2—Cycle 5 Condensed-Regimen Integrated Monitoring Program for Side 2 of the GHRIS

Plan

Purpose: The purpose of this program is to monitor the sensitivity, wavelength and detector calibrations of Side 2.

Description: 4 times per year, the following observations will be done:

DETECTOR CALIBRATIONS

- 1) dark count measurement
- 2) focus check at nominal high voltage and tweak current
- 3) flat field exposure at center of photocathode
- 4) coarse sample mapping function at central y deflection
- 5) coarse line mapping function at central x deflection

SENSITIVITY MONITORING

The sensitivity calibration will be monitored with the UV spectrophotometric standard star BD+28D4211. The medium resolution gratings will measure the standard through the LSA and SSA. 5 observations will be made between 1200 and 3000 Å

WAVELENGTH MONITORING

The spectral cal lamp mini-functional test for the first order gratings will be done. It is an internal test which makes measurements of the lamp (SC2). It is used to monitor the carousel function, y deflections, resolving power, and sensitivity.

Fraction of GO Programs Supported: All GHRIS programs using gratings G160M (19%), G200M (7%), and G270M (15%).

Resources:

Duration (orbits): Internal—32 orbits (8 orbits for each of the 4 executions. Note: the internal orbits are full orbits). External—12 orbits (3 orbits for each of the 4 executions).

PI: D. Soderblom, S. Hulbert, C. Leitherer, A. Schultz

The data will be reduced and analyzed by a technical assistants, L. E. Sherbert (0.08 FTE) and A. Gonnella (0.08 FTE) under the supervision of an Instrument Scientist (0.04 FTE per execution for a total of 0.16 FTE). Individual responsibilities for the IS are: detector calibrations: S. Hulbert; sensitivities: C. Leitherer; wavelengths: D. Soderblom.

Special Requirements: One complete set of observations (detector + sensitivity + wavelengths) should be on one SMS. The detector calibrations themselves should be executed within 24 hours. The 3 repeats should occur every 120 days to within 10 days.

Accuracy: Relative sensitivities will be measured to better than 2%. Wavelengths should be good to within 1 diode rms.

Products: The results of the test will be discussed in an ISR to be published 2 months after completion of the program.

Results

Modifications: None.

Execution: Nominal.

Resources Used:

Observation: 32 internal orbits, 12 external orbits.

Analysis: 0.16 FTE.

Accuracy Achieved: Nominal

Products: TIPS, DH97, ISR081 (wavelengths), ISR082 (detector calibrations).

Time-line: Program executed on approximately 9-14-95, 1-1-96, 4-30-96, and 8-27-96. Data examined to verify nominal performance. Results to be incorporated into *Data Handbook* as part of GHRS operational history.

Continuation Plan: Continued into Cycle 6 as program 6898.

6209: Cycle 5 G140L Photocathode Granularity Test for High S/N Stability

Plan

Purpose: To obtain a flat field for the G140L grating over a range of photocathode positions nominally covered by the G140L grating.

Description: The object of this program is to map artifacts on the surface of the photocathode due to granularity for the G140L grating. Locations of anomalous areas of the photocathode response will be determined by obtaining spectra of standard star BD+28°4211 centered in the LSA and the SSA. The GHRS will be commanded in WSCAN mode and a series of spectra will be obtained from different positions on the digicon faceplate, the photocathode.

This program need only be executed once at the start of Cycle 5.

Fraction of GO Programs Supported: 40 GHRS Cycle 5 programs (~27% of GHRS Cycle 5 programs).

Resources:

Duration (orbits): External-4 orbits

PI: Al Schultz

Data will be reduced by A. Gonnella (0.08 FTE) and analyzed by A. Schultz (0.04 FTE).

Special Requirements: Observations should be scheduled at the start of Cycle 5.

Accuracy: The G140L flat field is needed to remove the effects of instrumental blemishes (small scale irregularities on the detector face plate and photocathode) from spectra with reasonable signal-to-noise (S/N ~50). The flat field will allow observers with good S/N to achieve 2% photometric precision for their data without the need of using the FP-SPLIT mode of operating GHRS.

Products: The results for this program will be documented in an ISR and published within 2 months after completion of the program. The flat field reference file will be delivered to CDBS (relation CZPHCR, *.r1h files) for delivery to OPUS.

Calibration program 6209 will be delivered before the G140M sensitivity program (proposal 6212).

Results

Modifications: Star observed was BD+75.

Execution: Nominal.

Resources Used:

Observation: 4 external orbits.

Analysis: 0.12 FTE.

Accuracy Achieved: Nominal

Products: TIPS, ISR, CDBS files, ISR076.

Time-line: Program executed on 9-23-95. GHRS ISR076 issued 8-12-96.

Continuation Plan: One-time instrument characterization.

6210: GHRIS Scattered Light Test–Cycle 5

Plan

Purpose: To measure of the scattered light within 3 arcsec of the GHRIS Small Science Aperture.

Description: The object of this program is to measure the PSF from a point source in the SSA at various distances from the SSA. Thus, this is a combination PSF/scattered light test in that we measure the PSF at several different radii and at the same time obtain a measure of the contributed scattered light from nearby objects. This test will be carried out at two wavelengths, 2250 Å and 3050 Å, and will be used in conjunction with an SMOV test at 1450 Å to characterize the scattered light for GHRIS.

This program need only be executed once during Cycle 5.

Fraction of GO Programs Supported: This test will be used for close-out and archival purposes and supports 0% of Cycle 5 GO programs.

Resources:

Duration (orbits): External–4 orbits

PI: Steve Hulbert

Data will be reduced by L. E. Sherbert (0.04 FTE) and analyzed by S. Hulbert (0.02 FTE).

Special Requirements: None.

Accuracy: The accuracy goal of this test is 2% absolute for each measured point in the PSF.

Products: The results for this program will be documented in an ISR and published within 2 months after completion of the program.

Results

Modifications: None.

Execution: Will execute 12-21-96.

Resources Used:

Observation: Four external orbits.

Analysis: 0.06 FTE.

Accuracy Achieved: 2% relative.

Products: TIPS, ISR083.

Time-line: Program executed 12-21-96.

Continuation Plan: One-time instrument characterization.

6212: GHRS G140M Sensitivity and Vignetting Calibration Cycle 5

Plan

Purpose: To determine the sensitivity and vignetting functions of the G140M grating.

Description: The object of this program is to determine the sensitivity and vignetting of the G140M grating over its full wavelength range. The standard star μ Col is observed in the LSA and SSA at different central wavelengths using WSCAN mode. This grating was not fully characterized during Cycle 4 due to minimal GO demand (i.e., 1 GO program).

This program need only be executed once at the start of Cycle 5.

Fraction of GO Programs Supported: 15 GHRS Cycle 5 programs (~10% of GHRS Cycle 5 programs)

Resources:

Duration (orbits): External–3 orbits.

PI: A. Schultz

Data will be reduced by A. Gonnella (0.08 FTE) and analyzed by A. Schultz (0.04 FTE).

Special Requirements: Observations should be scheduled at the start of Cycle 5.

Accuracy: The sensitivity information is needed to achieve a requirement of 10% absolute (5% relative) calibration for observations obtained with the G140M grating.

Products: The results for this program will be documented in an ISR and published within 2 months after completion of the program. Calibration reference files will be delivered to CDDBS (relations: CZVIGR, CZABSR, CZNETR with corresponding files *.r2h, *.r3h, *.r4h).

Results

Modifications: None.

Execution: Nominal. One DQ comment indicates “failed,” but program was successful.fc

Resources Used:

Observation: 3 external orbits.

Analysis: 0.12 FTE.

Accuracy Achieved: Nominal

Products: TIPS, ISR088, CDDBS files.

Time-line: Program executed on 10-8-95.

Continuation Plan: One-time instrument characterization.

6213: GHRS Aperture Offsets—Cycle 5

Plan

Purpose: The purpose of this test is to measure the relative wavelength offset between the LSA and SSA apertures for all gratings.

Description: While measurements of the relative offsets between SC1/SC2 and the SSA were made prior to launch, no such measurements were made for the LSA. During OV/SV some measurements were obtained but they provided minimal results for the Side 2 first-order gratings only. While it has always been recommended that observers use the SSA to obtain the best wavelengths, this test will provide LSA observers with better pipeline-calibrated wavelengths for their observations.

The strategy is to observe at a series of carousel positions across each grating (order) in the LSA and SSA, taking a WAVECAL spectrum before each object spectrum. The wavelength coverage is needed as the pre-launch calibrations were found to vary nonlinearly with wavelength. Exposure times are the minimum exposure time for the default STEPPATT which should give a minimum signal-to-noise of about 20.

This test will execute once during Cycle 5.

Fraction of GO Programs Supported: This test supports all LSA observations.

Resources:

Duration (orbits): External—16 orbits.

PI: Steve Hulbert

Data will be reduced by L. E. Sherbert (0.04 FTE) and analyzed by S. Hulbert (0.02 FTE).

Special Requirements: None.

Accuracy:

Accuracy Requirement: 1 diode RMS for wavelengths in the LSA.

Products: Results of this test will be described in an ISR within two months of the execution of the test and a new reference table will be delivered to CDBS (relation CZCCR8R, table *.cz8).

Results

Modifications: None.

Execution: Nominal.

Resources Used:

Observation: 16 external orbits.

Analysis: 0.06 FTE.

Accuracy Achieved: Nominal

Products: TIPS, ISR080, CDBS files.

Time-line: Program executed on 7-23-96, 8-17-96, and 8-23-96.

Continuation Plan: One-time instrument characterization.