COS SMOV Morning Update

28 July 2009

This presentation contains material that is embargoed until after the SM4 ERO press conference. Images/spectra of external (astronomical) objects may not be altered, distributed, reproduced, published, displayed, or used in any other way without the consent of the STScI Director or the HST Project.
Agenda

- Recent Activity
- SMOV Program Status
- Recent Results
- Local Rate Check Anomaly
- Detector Feature – Segment B “Divots”
- Upcoming Ops Requests:
  - FUV OSM1 encoder positions (possible updates to implement by late Fri evening)
- Upcoming Uplinks
  - For USE OFFSET (genslew)
- Upcoming COS SMOV Timeline
Recent Activity

- **Fri 24 July (Day 205):**
  - 11466 visits 14, 17 (NUV Darks)
  - 11469 visit 12 (COS NUV Fine Optical Alignment Verification)
  - Ops Request: uplink FUV focus update – all gratings

- **Sat 25 July (Day 206):**
  - 11484 visit 4,5 (FUV Optical Alignment Verification – G130M, G160M)

- **Sun 26 July (Day 207):**
  - 11484 visit 6 (FUV Optical Alignment Verification – G140L)

- **Mon 27 July (Day 208):**
  - 11487 visit 50 (FUV Initial External Wavecals) LRC anomaly
  - 11485 visit 1 (FUV Initial Internal Wavecals)
  - 11478 visits 19-28 (NUV Internal Flats)
  - 11496: visit 2 (Internal PtNe Lamp 2 Tests – FUV)
  - Ops Request: uplink OSM2 encoder position: G285M

- **Tues 28 July (Day 209):**
  - 11478 visits 29-30 (NUV Internal Flats)
  - 11474 visit 01 (NUV External Wavecals – set 1 of 4)
# SMOV Program Status

<table>
<thead>
<tr>
<th>Activity / Program ID</th>
<th>Program Title</th>
<th>Activity ID</th>
<th>Program Title</th>
<th>Activity ID</th>
<th>Program Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COS02/11353</td>
<td>Mem Check</td>
<td>COS09/11469</td>
<td>NUV Opt Al TA</td>
<td>COS36/11494</td>
<td>NUV High S/N</td>
</tr>
<tr>
<td>COS03/11354</td>
<td>Sci Buffer</td>
<td>COS11/11471</td>
<td>NUV TA</td>
<td>COS30/11488</td>
<td>FUV Sp Perf I</td>
</tr>
<tr>
<td>COS04/11355</td>
<td>NUV HV</td>
<td>COS12/11472</td>
<td>Imag Perf</td>
<td>COS31/11489</td>
<td>NUV Ext λ</td>
</tr>
<tr>
<td>COS07/11355, v5</td>
<td>NUV Fold</td>
<td>COS13/11473</td>
<td>FUV Darks</td>
<td>COS14/11474</td>
<td>NUV Opt λ</td>
</tr>
<tr>
<td>COS23/11356</td>
<td>FUV HV</td>
<td>COS24/11482</td>
<td>FUV Funct</td>
<td>COS15/11475</td>
<td>NUV Fuc λ</td>
</tr>
<tr>
<td>COS06/11467</td>
<td>NUV Funct</td>
<td>COS25/11483</td>
<td>FUV Sens S/N</td>
<td>COS16/11476</td>
<td>NUV Ext λ</td>
</tr>
<tr>
<td>COS10/11470</td>
<td>NUV Int λ</td>
<td>COS19/11479</td>
<td>FUV Int λ</td>
<td>COS29/11487</td>
<td>NUV Ext λ</td>
</tr>
<tr>
<td>COS27/11485</td>
<td>NUV λ Verif</td>
<td>COS21/11481</td>
<td>FUV Sp Perf</td>
<td>COS17/11477</td>
<td>FUV Ext λ</td>
</tr>
<tr>
<td>COS10/COS27</td>
<td>Lamp2/GET</td>
<td>COS26/11484</td>
<td>NUV Ext λ</td>
<td>COS20/11480</td>
<td>FUV Str Th</td>
</tr>
<tr>
<td>COS05/11466</td>
<td>NUV Darks</td>
<td>COS28/11486</td>
<td>FUV Opt Al TA</td>
<td>COS32/11490</td>
<td></td>
</tr>
<tr>
<td>COS18/11478</td>
<td>NUV Flats</td>
<td>COS33/11491</td>
<td>Flats</td>
<td>COS35/11493</td>
<td></td>
</tr>
<tr>
<td>COS08/11468</td>
<td>NUV Foc Align</td>
<td>COS34/11492</td>
<td>FUV Sens</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data acquisition**

- Analysis
- Deliverables
  - PIT 3
  - 2
- On-time Status
  - 3
  - On

**Completed in progress upcoming**
sensitivity of all gratings is nominal
G185M, G225M, and G230L at or slightly above predicted (TV and ETC) values; G285M slightly below ground-values
• Segment B sensitivity ranges from 1-1.2x TV/ETC levels
• Segment A sensitivity ranges typically 10% less than TV/ETC levels
Wavelength Calibration Analysis

- **11470/11496/11469**: NUV WCA/PSA Wavelength Ranges
  - WCA wavelength ranges recorded on detector have been evaluated for all NUV grating central wavelength settings; subset of PSA ranges evaluated
  - Analysis of all stripes on Friday determined that all but one central wavelength setting places scientifically required wavelength ranges on detector
  - G285M 2695 encoder adjustment of +3 OSM2 steps (~150 pixel shift) required to place important Mg II 2796, 2084 lines entirely within stripe C range
- **Ops request implemented on Monday to support upcoming observations** of all PSA wavelength ranges beginning **209:05:05:22**

![NUV SMOV 11470 Internal Wavelength Coverage](image-url)
Additional Recent Analysis Activity

- **11487: FUV Initial External Wavecals (Visit 50)**
  - Evaluate PSA / WCA ranges in conjunction with 11485 internals
  - Initial analysis indicates all regions nominal; continuing evaluation to consider possible refinements

- **11484: FUV Optical Alignment**
  - Adjusted FUV focus position for all three gratings; ops request submitted Fri afternoon
  - Analysis of verification visits in progress

- **11478: NUV Flats**
  - Program continues; 30 of 36 acquired so far; preliminary analysis on Friday
Local Rate Check (LRC) Anomaly

- LRC failure
  - 11487: FUV Initial External Wavecals (Visit 50)
  - Last science exposure of visit: G140L 1230 FP-POS=4 FLASH=YES
  - 1036 counts recorded in 4-pixel wide “super-pixel” on short-wave segment B (LRC limit is 1000 counts)
    - Shutter closed; lamps turned off immediately after violation, normal data-taking ensues including recording of subsequent lamp flashes
  - Zero-order barely fell on the active area of detector
  - Choice of central wavelengths and FP-POS is intended to place zero-order off edge of detector; was successful for alignment used in TV
  - Same exposure setup (with same target) occurs on Fri in 11487 visit 3; plan to re-deliver as visit 73 with FP-POS=3 replacing FP-POS=4 exposure
G140L 1230 FP-POS=4 Zero-order Amelioration

• **Short-term amelioration**
  – Remove or replace FP-POS=4 in SMOV programs

• **Possible long-term amelioration strategies**
  – NOTE: not all targets will fail LRC with current settings
  – Restrict usage of FP-POS=4 to engineering users
  – Force HV to HVLOW for segment B with G140L 1230 FP-POS=4
    • Similar to current requirement for G140L 1105 all FP-POS
  – Alter encoder position for all G140L 1230 FP-POS
    • effectively shift all 1230 positions by one OSM1 step in + direction
      (would alter default central wavelength to ~1300 Å.)

• **Assess usage in SMOV and Cycle 17**
  – SMOV:
    • 2 exp this week in 11487 (external wavecals)
    • 2 exp in 11492 (1 PSA, 1 BOA sensitivity) – 229 SMS (week of 17 Aug)
  – Cycle 17
    • 24 exp in 8 programs (2 exp use segment B only – GTO)
FUV Segment B Detector Features: the “Divots”

- Anomalous, complementary detector features on segment B
- Features seen in PSA region of all segment B exposures with all gratings
- Possible mis-registration of charge for high-gain events; detailed analysis ongoing by IDT

*Figure 3: Close up of the features in pixel space for G130M (solid curve) and G160M (dotted) spectra extracted from images made from the RAWX and RAWY arrays (after PHA filtering). A ten pixel smoothing has been applied.*
FUV Segment B Detector Features: the “Divots”

- Presently operating at same HVNOM as used in ground testing
  - On-orbit operation results in higher gain than ground-tests
  - Charge-depletion is enhanced; shorter active-area lifetime
  - FUSE experience is that more HV transients occur at higher voltages
- Possible Divot Amelioration
  - Divot features greatly reduced or not seen in TV testing
  - Reduce gain to TV-levels by reducing voltage ~150 v
  - Propose to test with standard star observations in SMS 215
    - Repeat subset of 11492 visit 01 as visit 71 (2 orbits)
    - Use lowered HVNOM settings on both segments; load via patchable constant
    - Rapid evaluation
  - If reduces or removes feature, adopt new HVNOM as operational value
  - Test should be performed before execution of SMS222 and following
    (approximately 40 orbits of FUV SMOV calibration/verification)
Upcoming Uplinks (Ops Requests)

• Day 212: Fri 31 July (not yet submitted)
  – Ops request for possible OSM1 encoder position adjustments
    • will be submitted on Thursday morning, if necessary
    • Required for use in program 11487 visits 1,3 (73) on Fri morning to Sat morning: 212:11:40:17
Upcoming Uplinks (for genslew)

• Day 209: Tues 28 July (submitted)
  – USE OFFSET 11474A for 11474 visit 1 (executes early Tues morning)
  – USE OFFSET 11474B for 11474 visit 2 (executes Tues morning)
  – USE OFFSET 11474C for 11474 visit 3 (executes Tues afternoon)

• Day 210: Wed 29 July (not yet submitted)
  – USE OFFSET 11474K for 11474 visit 74 (executes early Wed morning)

• Day 212: Fri 31 July (not yet submitted)
  – USE OFFSET 11487A for 11487 visit 1 (executes Fri morning)
  – USE OFFSET 11487Z for 11487 visit 73 (executes Fri evening)

** ALL of the above USE OFFSETS will use same (V2,V3) offset **
Upcoming COS SMOV Timeline

• Day 209/210: Tues/Wed 28-29 July
  – 11474: visits 1, 2, 3, and 74 (4 of 6) (COS14) NUV External Wavecals
    • Apply uplinked offset (USE OFFSETs 11474A, B, C, and K) to blind pointing position to approximately center target in PSA; use ACQ/SEARCH, ACQ/PEAKXD, and ACQ/PEAKD with NUV to precisely center target;
    • Visits 1 and 2 use F-type RV standard stars, visit 3 uses NGC6833, a compact PN with many emission lines, and Visit 74 again uses Feige 48, a target with many absorption lines that has been observed with STIS; observations will be used to provide the primary external wavelength calibration and a thorough assessment of the post optical alignment spectral range available with each NUV central wavelength setting and the PSA. This information will be combined with TAGFLASH wavecals and the results of program 11470 to determine the magnitude of any additional OSM2 encoder adjustment required; also conducts FP-POS wavelength range evaluations and additional OSM drift characterization, and provides some spectra for direct PSA dispersion relation fitting

• 1147401 209:05:05:22 - 209:12:13:02
• 1147474 210:05:17:50 - 210:13:07:33
Upcoming COS SMOV Timeline

- Day 212: Fri 31 July
  - 11487: visits 1 and 73 (2,3 of 5) (COS29) FUV External Wavecals
    - Apply uplinked offset (USE OFFSETs 11487A and 11487Z) to blind pointing position to approximately center target in PSA; use ACQ/SEARCH, ACQ/PEAKXD, and ACQ/PEAKD with NUV to precisely center target;
    - Visit 1 uses NGC6833, a compact PN with many emission lines and Visit 73 again uses NGC330-B37, a target with many absorption lines that has been observed with STIS; observations will be used to provide the primary external wavelength calibration and a thorough assessment of the post optical alignment spectral range available with each FUV grating and the PSA. This information will be combined with TAGFLASH wavecals and the results of program 11485 to determine the magnitude of any OSM1 encoder adjustment required; also conducts FP-POS wavelength range evaluations and additional OSM drift characterization, and provides some spectra for direct PSA dispersion relation fitting
Upcoming COS SMOV Timeline

• Day 208: Wed 29 July
  – 11478: visit 31-36 (of at least 36) (COS18) NUV Internal Flats
    • Second increment of 18 visits will be executed this week; 1800-sec exposures with deuterium lamp 1 and G185M at cenwaves 1835, 1850, and 1864 (one per visit) to build up flat
    • 1147835 210:14:29:01 - 210:15:16:19
    • 1147834 210:16:08:00 - 210:16:51:48
    • 1147831 210:19:12:26 - 210:19:57:06