12678 - COS/FUV Characterization of Optical Effects

Cycle: 18, Proposal Category: CAL/COS
(Availability Mode: RESTRICTED)

INVESTIGATORS

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>E-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. David J. Sahnow</td>
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</tr>
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</tr>
<tr>
<td>Dr. Charles R. Proffitt</td>
<td>Computer Sciences Corporation</td>
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</tr>
</tbody>
</table>

VISITS

<table>
<thead>
<tr>
<th>Visit</th>
<th>Targets used in Visit</th>
<th>Configurations used in Visit</th>
<th>Orbits Used</th>
<th>Last Orbit Planner Run</th>
<th>OP Current with Visit?</th>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>(1) SK191, NONE</td>
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<td>14-Oct-2011 21:07:10.0</td>
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6 Total Orbits Used

ABSTRACT
This program will obtain COS FUV spectra of external targets at a range of cross-dispersion and dispersion positions in order to evaluate the optical performance of the spectrograph at different lifetime positions. Changes to throughput, resolution, gain, rotation, etc. as a function of position will be measured and compared to raytrace models. The data obtained in this program will be used, along with that from programs 12676 and 12677, to determine which positions are suitable for future science operations.

Initially (the first three visits), data will be collected at only G130M/1291, using all FP-POS positions. Followup observations may be made with the other FUV gratings once the initial results are examined.

**OBSERVING DESCRIPTION**

**STRUCTURE:**

This program currently consists of three two-orbit visits:

01 - G130M/1291 with (cross-dispersion, dispersion) = (0.0,0.0), (-3.0",0.0), (-6.0",0.0)

02 - G130M/1291 with (cross-dispersion, dispersion) = (0.0,0.0), (+3.0",0.0), (+6.0,0.0)

11 - G130M/1291 with (cross-dispersion, dispersion) = (0.0,0.0), (-3.0",-3.0"), (-3.0,+2.0")

More visits will likely be added once the initial data is evaluated.

Each visit follows the same pattern:

1. Perform an acquisition.
2. Take an exposure at the nominal position at one FP-POSs.
3a. Move the aperture to a position corresponding to an offset in the cross-dispersion and/or dispersion direction using ALIGN/APER.

Aperture positions are specified with the YAPER (XAPER) optional parameter, using a scale of -0.0476 arcseconds per YAPER (XAPER) step.

3b. Take an exposure with X and Y POS TARGs corresponding to the XAPER and YAPER value in the previous step. The ELNOAPMAIN special instruction is required for every exposure after an ALIGN/APER.

4. Repeat steps 2, 3a and 3b for the remaining positions.
TARGET COUNT RATES:
Both targets have been previously observed, so the count rates and spectra are known.

Previous observations of SK191 in G130M had ~2.5 c/s/resel; G160M had similar count rates. Thus, with exposure times of 300 seconds, we will obtain S/N of 40 - 50 per resel in this proposal.

LAMP FLASHES:
At locations where program 12677 has verified that there is no light leakage from the wavecal lamp, FLASH=YES has been used. At other locations, we have used FLASH=NO.

CALIBRATION JUSTIFICATION
Optical performance of the possible lifetime positions must be evaluated before moving to a new 'permanent' position.

ADDITIONAL COMMENTS
TIMING CONSTRAINTS:
Visits 01 and 02 have no constraints, and can be scheduled as soon as possible, since FLASH is set to NO for the +/-6" cross-dispersion position. If Program 12677 has completed and the lamp is found to be safe at -6", this proposal may be modified to set FLASH=YES in that case.

Visit 11 has no constraints since we have set FLASH=NO for the off-nominal exposures.
Proposal 12678 - Visit 01 - COS/FUV Characterization of Optical Effects

**Visit**
- Proposal 12678, Visit 01, scheduled
- Diagnostic Status: Warning
- Scientific Instruments: COS/FUV, COS
- Special Requirements: SCHED 70%
- Comments: G130M/1291 at (cross-dispersion, dispersion) positions of (0.0",0.0"), (-3.0",0.0"), (-6.0",0.0")

**Diagnostics**
- (Visit 01) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 01) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 01) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/PEAKXD.
- (Visit 01) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 01) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 01) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
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- (Visit 01) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 01) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

**Fixed Targets**

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Target Coordinates</th>
<th>Targ. Coord. Corrections</th>
<th>Fluxes</th>
<th>Miscellaneous</th>
</tr>
</thead>
</table>
| (1) | SK191 | RA: 01 41 42.0723 (25.4253012d)  
Dec: -73 50 38.20 (-73.84394d)  
Equinox: J2000 | Proper Motion RA: 3.19 mas/yr  
Proper Motion Dec: -2.90 mas/yr | V=11.84 | Reference Frame: ICRS |
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<tbody>
<tr>
<td>1</td>
<td>G130M/129 (1) SK191</td>
<td>COS/FUV, ACQ/PEAKXD, PSA</td>
<td>G130M 1291 A</td>
<td>NUM-POS=5;</td>
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<td>POS TARG 0.0,0.0</td>
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<td>2 Secs</td>
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<td>2</td>
<td>G130M/129 (1) SK191</td>
<td>COS/FUV, ACQ/PEAKD, PSA</td>
<td>G130M 1291 A</td>
<td>NUM-POS=5; STEP-SIZE=1.0</td>
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<td>2 Secs</td>
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<tr>
<td>3</td>
<td>G130M/129 (1) SK191</td>
<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M 1291 A</td>
<td>BUFFER-TIME=16; FP-POS=1; FLASH=YES</td>
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<td>Aperture at - 3.0 arcsec (XD) (0)</td>
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<td></td>
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<td>G130M/129 (1) SK191</td>
<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M 1291 A</td>
<td>BUFFER-TIME=16; FP-POS=ALL; FLASH=YES</td>
<td></td>
<td>SPEC COM INSTR ELOAPMAIN</td>
<td></td>
<td>300 Secs</td>
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<td>Aperture at - 0.0 arcsec (XD) (0)</td>
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<td></td>
<td>XAPER=0;</td>
<td></td>
<td>0.0 Secs</td>
<td>[1]</td>
</tr>
<tr>
<td>7</td>
<td>G130M/129 (1) SK191</td>
<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M 1291 A</td>
<td>BUFFER-TIME=16; FP-POS=3; FLASH=YES</td>
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<td>SPEC COM INSTR ELOAPMAIN</td>
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<td>300 Secs</td>
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<td>8</td>
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<td>XAPER=126;</td>
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<td>9</td>
<td>G130M/129 (1) SK191</td>
<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M 1291 A</td>
<td>BUFFER-TIME=16; FP-POS=ALL; FLASH=NO; WAVECAL=NO</td>
<td></td>
<td>SPEC COM INSTR ELOAPMAIN</td>
<td></td>
<td>300 Secs</td>
<td>[2]</td>
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</table>

Comments:
- FUV Exposure at 0.0 arcsec with aperture at 0.0 arcsec.
- Move aperture to an alternate lifetime position. This corresponds to displacement in the cross-dispersion direction of: -3.0 arcsec (63 x -0.0476)
- FUV Exposures at -3.0 arcsec with aperture at -3.0 arcsec.
- Move aperture back to nominal position.
- FUV Exposure at 0.0 arcsec with aperture at 0.0 arcsec.
- Move aperture to an alternate lifetime position. This corresponds to displacement in the cross-dispersion direction of: -6.0 arcsec (126 x -0.0476)
- FUV Exposures at -6.0 arcsec with aperture at -6.0 arcsec.

FLASH currently set to NO, but this may change after the final visits of 12677 are completed.
Proposal 12678 - Visit 02 - COS/FUV Characterization of Optical Effects

**Visit**
- Proposal 12678, Visit 02, scheduled
- Diagnostic Status: Warning
- Scientific Instruments: COS/FUV, COS
- Special Requirements: SCHED 70%

**Comments:** G130M/1291 at (cross-dispersion, dispersion) positions of (0.0",0.0"), (+3.0",0.0"), (+6.0",0.0")

**Diagnostics**
- (Visit 02) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 02) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 02) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 02) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/PEAKXD.
- (Visit 02) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 02) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
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<tbody>
<tr>
<td>1</td>
<td>G130M/129</td>
<td>(1) SK191</td>
<td>COS/FUV, ACQ/PEAKXD, PSA</td>
<td>G130M</td>
<td>1291 A</td>
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<td>2</td>
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<td>1291 A</td>
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<td>4</td>
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<tr>
<td>6</td>
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<td>9</td>
<td>G130M/129</td>
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<td>G130M</td>
<td>1291 A</td>
<td>BUFFER-TIME=16;</td>
<td>POS TARG 0.0,0.0;</td>
<td>300 Secs</td>
<td>[2]</td>
</tr>
</tbody>
</table>

Comments: FUV Exposure at 0.0 arcsec with aperture at 0.0 arcsec.

Comments: Move aperture to an alternate lifetime position. This corresponds to displacement in the cross-dispersion direction of: +3.0 arcsec (-63 x -0.0476).

Comments: FUV Exposures at +3.0 arcsec with aperture at +3.0 arcsec.

Comments: Move aperture back to nominal position.

Comments: FUV Exposure at 0.0 arcsec with aperture at 0.0 arcsec.

Comments: Move aperture to an alternate lifetime position. This corresponds to displacement in the cross-dispersion direction of: +6.0 arcsec (-126 x -0.0476).

Comments: FUV Exposures at +6.0 arcsec with aperture at +6.0 arcsec.

FLASH currently set to NO, but this may change after the final visits of 12677 are completed.
### Visit 11 - COS/FUV Characterization of Optical Effects

**Proposal 12678, Visit 11**

- **Diagnostic Status:** Warning
- **Scientific Instruments:** COS/FUV, COS
- **Special Requirements:** SCHED 80%
- **Comments:** G130M/1291 at (cross-dispersion, dispersion) positions of (0.0",0.0"), (-3.0",-3.0"), (-3.0",+2.0")

### Diagnostics

- (Visit 11) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 11) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
- (Visit 11) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/PEAKXD.
- (Visit 11) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
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<tbody>
<tr>
<td>1</td>
<td>G130M/129</td>
<td>(1) SK191</td>
<td>COS/FUV, ACQ/PEAKXD, PSA</td>
<td>G130M</td>
<td>1291 A</td>
<td></td>
<td></td>
<td>2 Secs</td>
<td>[I]</td>
</tr>
<tr>
<td>2</td>
<td>G130M/129</td>
<td>(1) SK191</td>
<td>COS/FUV, ACQ/PEAKD, PSA</td>
<td>G130M</td>
<td>1291 A</td>
<td>NUM-POS=5; STEP-SIZE=1.0</td>
<td></td>
<td>2 Secs</td>
<td>[I]</td>
</tr>
<tr>
<td>3</td>
<td>G130M/129</td>
<td>(1) SK191</td>
<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M</td>
<td>1291 A</td>
<td>BUFFER-TIME=16 POS TARG 0.0,0.0 5; FP-POS=1; FLASH=YES</td>
<td></td>
<td>300 Secs</td>
<td>[I]</td>
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<tr>
<td>4</td>
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<td>[I]</td>
</tr>
<tr>
<td>5</td>
<td>G130M/129</td>
<td>(1) SK191</td>
<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M</td>
<td>1291 A</td>
<td>BUFFER-TIME=16 POS TARG -3.0,-3.0 5; FP-POS=ALL; SPEC COM INSTR ELNOAPMAIN FLASH=NO; WAVECAL=NO</td>
<td></td>
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</tr>
<tr>
<td>6</td>
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<td>0.0 Secs</td>
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<tr>
<td>7</td>
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<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M</td>
<td>1291 A</td>
<td>BUFFER-TIME=16 POS TARG 0.0,0.0; SPEC COM INSTR ELNOAPMAIN</td>
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<td></td>
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<td>0.0 Secs</td>
<td>[I]</td>
</tr>
<tr>
<td>9</td>
<td>G130M/129</td>
<td>(1) SK191</td>
<td>COS/FUV, TIME-TAG, PSA</td>
<td>G130M</td>
<td>1291 A</td>
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<td></td>
<td>450 Secs</td>
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</tbody>
</table>

Comments: FUV Exposure at 0.0 arcsec with aperture at 0.0 arcsec.

Comments: Move aperture to an alternate lifetime position. This corresponds to displacement in the cross-dispersion direction of: -3.0 arcsec (63 x -0.0476), and in the dispersion direction of: -3.0 arcsec (-63 x 0.0476).

Comments: FUV Exposure at (-3.0, -3.0) arcsec (XD, D) with aperture at (-3.0, -3.0) arcsec. FLASH set to NO at non-standard dispersion locations.

Comments: Move aperture back to nominal position.

Comments: Move aperture to an alternate lifetime position. This corresponds to displacement in the cross-dispersion direction of: -3.0 arcsec (63 x -0.0476), and in the dispersion direction of: +2.0 arcsec (42 x 0.0476).

Comments: FUV Exposures at (-3.0, +2.0) arcsec (XD, D) with aperture at (-3.0, +2.0) arcsec. FLASH set to NO at non-standard dispersion locations.

Proposal 12678 - Visit 11 - COS/FUV Characterization of Optical Effects
Orbit Structure

Orbit 1

GS Acq

Exp. 1

Exp. 2

Exp. 3

Pointing Maneuver

Exp. 4

Exp. 5, split 1

Exp. 5, split 2

Exp. 5, split 3

Exp. 5, split 4

Pointing Maneuver

Unused Visibility = 110

Occultation

Exp. 6

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 secs.