WFC3 SMOV Science Report

2009 August 07

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1) Update on 11447: IR Dark Current, Readnoise and Background
2) Update on analysis of Proposal 11798: UVIS PSF Core Modulation
3) 11552: Characterization of the WFC3 IR Grisms
11789, UVIS PSF Core Modulations

- **Activity - Visit 1**
- **Objective** – measure the characteristics of UVIS PSF in short consecutive short exposures. UVIS shutter consists of two blades that rotate in one direction, so Side 1 and Side 2 alternately shade consecutive exposures. The shutter movement causes vibrations of the UVIS channels that affect the UVIS PSF peak and shape in the short exposures.
- **Status** – We have acquired ~50 exposures of 0.5, 1, 3, and 10 seconds of the standard star GD153 in the filters F606W, F555W, and F658M. For each exposure we measured the FWHM, the peak intensity, the flux within 3 pxl, and the magnitude with an aperture radius of 3, 5, 7, and 10 pxl.
- **Results** – (preliminary analysis was reported earlier)
  - Excellent test of optics
  - Change in PSF, stellar shape is due to breathing, not shutter effects.
11789, UVIS PSF Core Modulations

<table>
<thead>
<tr>
<th>exposure time (seconds)</th>
<th>Ground</th>
<th>In Orbit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>FWHM</td>
<td>2.07+/-</td>
<td>2.21+/-</td>
</tr>
<tr>
<td></td>
<td>0.09</td>
<td>-0.20</td>
</tr>
<tr>
<td>RMS Peak variation</td>
<td>8%</td>
<td>14%</td>
</tr>
<tr>
<td>RMS Flux variation</td>
<td>0.4%</td>
<td>1%</td>
</tr>
</tbody>
</table>
11789 Aperture Photometry

Aperture photometry
0.5 sec

Aperture photometry
1.0 sec

Aperture photometry
3.0 sec

Aperture photometry
10.0 sec

<table>
<thead>
<tr>
<th>exposure</th>
<th>3 pix</th>
<th>5 pix</th>
<th>7 pix</th>
<th>10 pix</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 sec</td>
<td>0.02</td>
<td>0.006</td>
<td>0.006</td>
<td>0.007</td>
</tr>
<tr>
<td>1.0 sec</td>
<td>0.03</td>
<td>0.007</td>
<td>0.006</td>
<td>0.005</td>
</tr>
<tr>
<td>3.0 sec</td>
<td>0.02</td>
<td>0.004</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>10.0 sec</td>
<td>0.007</td>
<td>0.004</td>
<td>0.004</td>
<td>0.004</td>
</tr>
</tbody>
</table>
11798 Ellipticity of the star
Embargoed figure - Do not distribute

T=0.5 sec
11798 Position vs. exposure number

T=0.5 sec

V2

V3

T=1.0 sec

V2

V3

exposure number
11798 Ellipticity vs. exposure number

Embargoed figure - Do not distribute

![Graph showing ellipticity vs. exposure number with different exposure times (0.5 sec, 1.0 sec, 3.0 sec, 10 sec, 20 sec).]
11798 Ellipticity vs Time (of exposure)

Embargoed figure - Do not distribute

0.5 sec
1.0 sec
3.0 sec
10 sec

Breathing!!
<table>
<thead>
<tr>
<th><strong>11447 IR Dark Current, Readnoise &amp; Background</strong></th>
</tr>
</thead>
</table>

- **Activity** - 16 of 22 visits completed.
- **Objective** – Measure dark current, readnoise and sky background.
- **Status**
  - Visits before (visit 2) and after (visit 10) CSM placed at UVIS position when taking darks
- **Results**
  - CSM fix in place for Visit 10 seems to have limited the scattered light reaching the IR detector
  - see following figures.
HST pointed at the bright Earth for a large portion of both ramps

Visit 02 - prior to CSM fix

Visit 10 - after CSM fix
Despite similar observing conditions, the CSM fix in place for Visit 10 seems to have limited the scattered light reaching the IR detector.
11552, Characterization of the WFC3 IR Grisms

• Activity - Visits 04, 07, 08 (complete).
• Objective – Measure image displacement, spectral trace and dispersion, and throughput of the IR G102 and G141 grisms, all as a function of field position.
• Status
  – Visit 04: Successfully obtained G141 spectra of flux standard GD-153 at 3 different IR field points (center and two corners) -(presented on 04 August 2009 SMOV meeting)
  – Visit 08: Successfully obtained G141 spectra of Planetary Nebula PN G111.8-02.8 at 9 different IR field points to use for wavelength calibration.
  – Visit 07: G102 spectra of PN G111.8-02.8 are TBD
• Results
  – Quick look shows both sources well exposed and at expected locations within the field (figure on next slide)
  – ST-ECF grism support team will be analyzing starting next week.
11552: PN G111.8-02.8 with G141

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