3/13/96
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Modifications/Reordering of Vacuum Alignment Procedure

STIS science team representatives have reviewed the final signed off version of the Vacuum Alignment/Verification Procedure, SER STIS-OAT-053. We recommend the following modifications to the procedure. Some of the modifications involve different exposure configurations than are currently listed in the procedure; many are simply reordering of the steps of the procedure to make optimal use of the available illumination.

Overall Illumination Philosophy

We recommend modifying the FFUSS/SRS configuration so as to provide a demagnification of the SRS source by a factor of 2 at the FFUSS input image plane, at an f/# faster than f/24, which will then be limited by FFUSS stops to f/24 before the beam is input to STIS.

With such a configuration, the absolute throughput measurements can be made with a projected spot of roughly 0.5 mm diameter at the FFUSS input, with no additional pinhole required there. The remainder of the procedure steps requiring external illumination can be carried out with a Pt lamp in the SRS. With no pinholes at the lamp, the illumination at the FFUSS input should be approximately 1 mm diameter (half the diameter of the Pt emission at the lamp). This will suffice to fill small slits at the STIS slit plane, permitting determination of the MSM pointing for all modes, as well as supporting echelle mode resolution tests and vignetting scans.

For resolution mapping in the long-slit modes, we will need to use the internal (IM system) Pt lamp in order to fill the field of view to the ends of the long slits.

Note: By eliminating the pinhole at the FFUSS input plane for the throughput test, we can eliminate the need to break vacuum between the throughput tests and the rest of the procedure. We probably need to change a pinhole in the SRS between the throughput tests and the other tests, but we will be changing the lamp anyway..

SPECIFIC PROCEDURE COMMENTS:

8.4 MSM and Slit Wheel Repeatability Test

If it is possible to do this test in the nitrogen purge run-through before pumpdown, let's do so. The MSM pointing tables we derive from the vacuum test will not be meaningful if we do not have repeatable MSM and slit wheel operations. Let's find out if we have a problem before we take a lot of precise pointing data.

In the MSM repeatability section, change slit 34 to slit 21--this sequence is supposed to move the MSM only, with no motions of the slit wheel.

In the slit wheel repeatability section, change slit 34 to slit 20. We will not be illuminating much of the field, so we need to use a small slit whose edges can definitely be seen. Slit 20 is adjacent to slit 34, so we will be making the same sort of rotation of the slit wheel between steps as intended by the original procedure.

If we end up unable to do this in a pre-pumpdown purge test, then it should be done after the Krypton and Xenon throughput measurements (i.e. before Section **8.3**).

8.1 Band 1 Optical Throughput (Kr)

No FFUSS pinhole. 1 mm pinhole in front of the krypton lamp in the SRS.

8.1.25 Do the exposures through the Lyman alpha and SrF2 filters using Mode 1.1, not Mode 1.6f. Do them immediately following the Mode 1.1 aperture 10 (clear) exposure. This will enable us to measure transmission of the filters at the 1236 line without confusion from other wavelengths.

for the filters, do:
-- aperture 2 (Lyman alpha)
-- aperture 7 (SrF2) likely to get only an upper limit at 1236

Data Analysis: We need the efficiency of the PMT and pickoff mirror, not the PMT alone.

8.2 Band 1 Optical Throughput (Xe)

No FFUSS pinhole. 1 mm pinhole in front of the krypton lamp in the SRS.

As in Section 8.1, take the filtered exposures in Mode 1.1, not Mode 1.6f, immediately following the Mode 1.1 aperture 10 (clear) exposure.

for the filters, do:
-- aperture 2 (Lyman alpha) may get upper limits only
-- aperture 3 (quartz)
-- aperture 7 (SrF2)

8.3 Band 1 Focus and Wavelength Position Tests
8.5 Band 1 Scan Positions
8.8 Echelle Cross Disperser Scans
8.9 Band 1 Selected Retests

The two main purposes of this entire group of sections are 1) to determine and verify proper MSM pointing values for all modes, and 2) to evaluate image quality/spectral resolution over the full detector format for all modes (i.e. over the full long slit field of view for first order modes). We will also get a lot of data on stray light performance as a fringe benefit.

We need to keep those primary goals distinct and accomplish each in the proper order, with the illumination source best suited to the purpose. That framework suggests the following order and choice of exposure configurations for the tests:

a) Make a first run through of all the first order and camera mode exposures in sections 8.3 and 8.5, using the SRS Pt lamp. Because we will only be illuminating a small part of the MAMA field, we will need to use small slits, whose edges can be seen, in order to properly determine the MSM pointing in the spatial direction.

-- for modes 1.1, 1.2, 1.6, and 1.6f use slit 25 (0.063" x 1.0") [0.063" in dispersion]
-- for modes 1.7x3 and 1.7x4 use slit 27 (0.5" x 0.2") [0.2" in dispersion]

b) For echelle modes 1.3 and 1.4, at the nominal central wavelength in the cross-dispersion direction, do the Section 8.8 cross-disperser scans along the echelle orders in order to determine the proper pointing in the echelle blaze direction. Use the SRS Pt lamp for these measurements.

-- move to larger slit (e.g. slit 21) if count rates are prohibitively low; we are after blaze profile, not resolution, in this test.

c) When the first order mode pointing corrections have been calculated and new MSM values derived, take exposures with those new MSM settings and verify proper pointing. Again use the SRS Pt lamp.

d) With the best guess echelle mode centering in the elevation direction, take IM krypton lamp exposures in modes 1.3 and 1.4 p1 (steps 8.7.16 to 8.7.19). The continuum spectrum provides another means of evaluating the centering of the echelle blaze. Use a slit to give as high a safe count rate as possible without order confusion (slit 27, 0.5" x 0.2" is a good guess).

e) When the best cross-disperser elevations have been derived for the echelle modes, take exposures at all the primary and intermediate scan positions, using the SRS Pt lamp and slit 19. (We have already centered the blaze to the extent possible using the data from step b; now we need to get the right MSM pointing in the cross-dispersion direction.)

f) Fit the wavelengths and derive pointing corrections in the cross-dispersion direction. Take exposures with the SRS Pt lamp and slit 19 at all primary and intermediate positions (Step 8.5.8).

g) Switch to the mono-isotopic Pt lamp and take the following images in mode 1.4:

-- p1
slit 20 (0.09") repeller ON
slit 19 (0.063") "
-- p3

	slit 19 (0.063")	"	
	slit 20 (0.09")	"	
-- p2			
	slit 20 (0.09")	"	
	slit 19 (0.063")	"	
	slit 19 (0.063")	repeller OFF	
	slit 30 (0.025")	repeller OFF	ultimate resolution test

h) Using the Pt lamp in the IM system, take long-slit exposures with the appropriate 2-pixel wide slits (34 and 51) for all first order modes and mode 1.6 in order to evaluate resolution over the full field. *(For mode 1.6, we are likely to violate the local count rate limit with a clear 2-pixel slit. We will likely need to take these exposures through the ND filtered long slits 61 and 65.)*

8.7 Cal Subsystem Throughput

Basically as written. We should in addition check the count rate for those camera mode-filter combinations for which predicted Pt lamp rates are safe at 1 mA. These are expected to be:

--mode 1.6	aperture 10	1 mA	!!!
--mode 1.6f	aperture 2 (Lyman Alpha)	1 mA	!!!
--mode 1.6f	aperture 3 (quartz)	1 mA	!!!
--mode 1.6f	aperture 7 (SrF2)	1 mA	!!!

The lamp must be turned on with the CIM out of the beam for 1 mA exposures!!

8.8 Band 1 Image Quality Over Field of View

If the external illumination system can only cover a small field (< than the 6" x 6" arcsecond size of the slit called for by the procedure for this test), than we will need to switch to using the IM Pt lamp.

For the expected count rates from the IM lamp, it will be difficult to perform the "edge acuity" test that the procedure calls for (which can only be done at very low per-pixel count rates). Instead, we will use off-nominal slit wheel positions and off-nominal pointing of the MSM to position images of 2-pixel wide long slits at a grid of places on the detector. These exposures can be at significant local count rates and can thus be quite brief.

--image slit 65 at nominal slit wheel rotation, and at +/-0.65 degrees and +/-1.30 degrees from the nominal slit wheel rotation. At each position, use off-nominal MSM tils in elevation (+/-0.077 degrees) in order to bring the ends of the long slit into the field for evaluation of the edge acuity in the spatial direction.

--image slit 61 at off-nomiinal MSM tilts (+/-0.11 degrees and +/-0.22 degrees)

Note: these off-nominal slit wheel rotations will bring adjacent slits into the field of view; the adjacent slits are slit 63 (0.20" x 0.05"; ND 1.0) and slit 57 (24.7" x 24.7"; ND 5).