REQUIREMENTS FOR THE PLANNED APT-VERSION OF THE STIS ETC

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In addition to all the standard features that currently exist in the STIS ETCs (which are listed at the end of this message), the following features would be desirable in the planned improved java-version of the STIS ETC (in order of priority):

1. Narrow emission line, extended sources for slitless modes
2. Option to vary MAMA darks
3. Correcting for CTE loss
4. Coronographic capability
5. Taking into account the varying sensitivity of the spectroscopic modes
6. Correct Sky model taking the target position into account

Items 1,2,3,4 and 5 are for spectroscopic modes, and items 2,3,4 and 5 are for the imaging modes.

More details of the individual items are described below.

1. NARROW EMISSION LINE, EXTENDED SOURCE FOR SLITLESS MODES:

The current version of the STIS ETC does not correctly account for narrow emission line, extended sources, for observations taken in slitless mode. This should fixed as explained below.

Increasing the slit width on a spatially extended source degrades the resolution. This degraded resolution is:
D = (slit-width) / (mlambda) * (delta-lambda per pixel)
where mlambda is the plate-scale in the dispersion direction. In other words, the actual resolution is degraded by a factor R, the slit width in pixels/2. In the current implementation, the ETC degrades the resolution ONLY for emission lines added on the web form. For emission lines added on the web form, the ETC degrades the resolution prior to folding the spectrum through the instrument response. Thus the output emission line does not generally have a flat top, but instead reflects the instrument response as a function of wavelength in that spectral region. In actuality, the observed emission line will have nearly uniform flux across the slit width, which needs to be correctly taken into account.

FUV Background Estimates when using Wide slits

This a special case of narrow emission line, extended source case.

Similar to the extended source case above, when the slit is widened, spectral features in the sky background are not generally broadened by the ETC. This means, in particular, that the sky background in slitless-spectroscopy mode is not modeled quite properly by the ETC. While the continuum sky background is not broadened by the ETC, the geo-coronal line emissions of Hydrogen Lyman alpha line at 1216 Å and the O I lines at 1302, 1352 Å are broadened by the slit width prior to applying the instrumental response. Therefore, while the general broadening of the brightest sky lines with wide slits is approximately

correct, the detailed shape of the sky background is different from reality. In the FUV in particular, the ETC slitless spectroscopy background bears little resemblance to a real image, which will have nearly uniform Ly-alpha background covering 2/3 of the detector (toward short wavelength) and OI and detector background nearly uniform toward longer wavelengths. The sky backgrounds around the geo-coronal lines are particularly affected for prism slitless mode.

The algorithm needs to be changed so that a 'flat-topped' profile is reproduced in such cases, as expected.

2. Varying MAMA darks

The dark current rate for the NUV-MAMA is nominally 10^-3 c/pix/sec. This is about 2 orders of magnitude higher than that of FUV-MAMA, and can significantly affect observations of faint sources. So it is important that the NUV-MAMA dark current is properly taken into account.

After the next service mission, it is possible that the dark-current is higher, or it is variable (depending on the performance related to NICMOS cooling system). So it would be desirable to have the option to change the dark-current rate for the MAMA detectors.

3. Correcting for CTE loss

As is now well known, the STIS CCD suffers from CTE-losses, which is increasing with time. This is particularly serious for faint sources. So it would be nice if the ETC takes this effect into account. However, this effect depends on the location of the source on the detector, and some further discussions would be required to work out the exact details.

4. Coronographic capability

Now that the STIS PSF is reasonably well-determined, it should be possible to include a coronographic mode for the STIS imaging ETC. Since the STIS PSF has a strong azimuthal dependence, we suggest that there is one 'best-case' and 'worst-case' scenario (where the worst-case corresponds to the source being on the diffraction spike of the brighter component). This option would require the user to specify (i) the brightness of the brighter star, (ii) the brightness of the fainter star, (iii) distance of the fainter star from the brighter one, and (iv) best/worst case. The contribution from the bright star can be modeled similar to the 'background', which can have two forms for the best/worst cases.

5. Varying sensitivity

The sensitivities of some of the STIS grating modes are known to vary with time, which we plan to implement in the STIS pipeline. It would be nice to include this in the ETC as well, where the formulae used in the pipeline may be used by the STIS ETC.

6. Correct Sky model

Currently, the STIS ETC uses only 'low', 'medium' and 'high' values for the zodiacal and earth-shine contributions where the 'low' and 'medium'

are arbitrarily taken as 30 and 50% of the 'high' value. This should be improved to more realistic values taking the coordinates of the targets into account. Taking a sky model of the background into account, the ETC can determine the background appropriate for the source location.

CURRENT Standard Features in the STIS ETC

What follows is the standard features of the current ETC, as gleaned from the actual ETC. For more details, see: http://garnet.stsci.edu/STIS/ETC/stis_spec_etc.html (for the spectroscopic ETC) and the associated help files. The standard features in the imaging and target-acq ETCs are only a subset of the spectroscopic ETC (which are linked to the above page).

1. Mode (grating filter)
2. Exposure parameters:
   a. Exposure time needed to obtain a S/N ratio of
   b. S/N ratio or exposure time specified

3. Spectral distributions for the source:

   a. User Supplied Spectrum:
   b. Kurucz Models:
   c. HST Standard Star spectra:
   d. Non-Stellar Objects:
   e. QSO with redshift z =
   f. Black-body with temperature T =
   g. Power-law: Flambda = lambda **
   h. Flat continuum
   i. No continuum. If selected, at least one emission line must be specified below, and the reference wavelength from part 2 above must correspond to one of the lines.

   j. Add emission lines to the input spectrum (optional):

4. Normalize the target's continuum flux.

   a) Point source with: = erg cm-2 s-1 Å-1 at Å
      Do not renormalize Point Source spectrum. Use only for User Input Spectrum or Calibration Spectra.

   b) Extended source with a diameter of .. arcsec with: =
      erg cm-2 s-1 Å-1 arcsec-2 at Å
      Do not renormalize Extended Source spectrum. Use only for User Input Spectrum or Calibration Spectra.

5. Specify the extinction E(B-V) =

6. Specify the expected background levels :

   Zodiacal Light Bright Earth

7. Additional parameters for CCD only:

   a.Binning b.Gain c.CR-SPLIT