# Update on calibration

background flats

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# FUV Background

Summary:

Visible/IR light infiltrates FUV spectrograph after reflection off filter back on to slit prism

Interferes with FUV flat field determination/application because Vis/IR light is absorbed deep in the thinned CCD



#### background changes intensity with pointing



#### background changes shape (slightly) with pointing



#### background intensity properties change with filter



#### background does not change with time



DN/15sec exposure





Determination:

I. Average BG level is determined for each filter/pointing from off-slit area

2. BG functional form is fit for each filter

3. Off limb images are normalized and used to construct average BG image, smoothed with a Butterworth filter of 30 pixels scale







Application:

I. Scaling factor is calculated from BG function based on filter present during FUV observation, pointing

2. Scaling is applied to mean BG image and result is subtracted from the data (in the same phase as dark correction)

- Standard dark correction is not accurate enough to produce a satisfactory background correction for long images (30 sec)
- Recently improved sequence with darks at every pointing

# Spectrograph Flats

- Improved FUV sequence with darks every 20 images
- allows for accurate application of BG correction

Determination:

I. Average image is constructed from flat sequence (defocused, dithered)

2. Image warped to make lines straight

3. Construct:

Spatial flat (averaged in spectral dimension)



Spectral flat (smoothed in spatial dimension)

4. Warp images back to original coordinates and divide patterns from average image

CCDs have diagonal structure which interferes with determination of the "true" spectral and spatial patterns, Lamp flats taken on the ground are divided from the data before this step.

# NUV average



### NUV spatial flat

# NUV spectral flat



#### NUV final flat



#### NUV CCD flat



# FUVI average



### FUVI spectral flat



# FUVI spatial flat

#### FUVI final flat

# FUVI spatial+CCD flat

