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How the number of pixels corresponding to the total area used for the flux of a planet (Neptune, Uranus) was chosen:

The 2-sigma ellipse of an elliptical Gaussian fit (i.e., standard deviation in x and y allowed to differ) to a planetary PSF was used to define the apparent area of the planet. The area for Uranus did not include its rings since the spectra are in surface brightness. For the apparent area for surface brightness, 2-sigma seemed right when inspecting the images by eye.

The 4 images used for the 4 planetary sequences are from the Hubble Space Telescope (HST). The other `eetc` sequences are based on `cgisim`-generated images with no noise. All these images can be found at this Alfresco link, in the "data" subfolder: https://alfresco.jpl.nasa.gov/share/page/site/cgi/documentlibrary?file=PSF%20data%20for%20eetc%20peak%20flux.zip#filter=path%7C%2FRoman%2520CGI%2520Collaboration%2520Area%2F06%2520-%2520CTC%2FWFSC%7C&page=1

Total area corresponding to the total flux:
Neptune, Band 1: 4451 HST pixels
Neptune, Band 4: 4607 HST pixels
Uranus, Band 1: 11246 HST pixels
Uranus, Band 4: 12360 HST pixels

Using the numbers above, the planet's apparent area in arcsec^2 (for the `manual` parameter) is: (total area in HST pixels) * (0.03962000086903572^2 arcsec^2/HST image pixel).

The conversion factor from HST pixel to arsec^2 comes from the header information from the FITS files for the planet images in the folders with planet names at the same level as the "data" folder from the Alfresco link. One of the FITS files from these folders was used in the "data" folder for actually extracting information for `eetc`, and which file is indicated in a TXT file in the planetary sequence folders in "data".

These numbers for the area in arcsec^2 were used for converting Vmag/arcsec^2 to Vmag for the `manual` parameter for planets. See the `eetc` README for instructions on using `manual` for specifying the number of arcsec^2 for the planet itself for a planetary sequence.

Note: The `fraction` and `peak_flux_ratio_pix` parameters for these planetary sequences were calculated with respect to the TOTAL frame of each image, not the 2-sigma ellipse for the planets. The planet frames have some noise in them, so one could get these numbers using just the 2-sigma ellipse (to reduce the amount of noise tainting the calculation), but the difference is small. The `peak_flux_ratio_pix` parameter for these planetary sequences were converted from the area in arcsec^2 to the number of Roman Telescope pixels using the conversion factor (0.0218^2 arcsec^2/Roman pixel). This is done in `eetc.sequences_edit.py`.

One could insert the following lines just before the return of `get_num_pixels_and_fraction(array, thresh)` in

`eetc.sequence_tools.py` to obtain the area numbers above when reading in the arrays of the planet images from the Alfresco link and using the function input `thresh=0.5`:

```
        ellipse_num_sig = rsX**2/(num_sig*sx)**2 + rsY**2/(num_sig*sy)**2
        ell_num_sig_ind = np.where(ellipse_num_sig <= 1)
        # total area for total flux: got 4451 for Neptune Band 1, 4607 for
        # Neptune Band 4, 11246 for Uranus Band 1, and 12360 for Uranus Band 4
        # 'manual' parameter should be total area * HST_im_pix, where
        # 0.03962000086903572**2 as^2/HST image pix
        total_area = ell_num_sig_ind[0].size
```