SWIFT-UVOT-CALDB-##
Date Original Submitted: 7th November 2005
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Revision #03
Revised by: Alice Breeveld
Pages Changed: all
Comments: Added white filter transmission curve

SWIFT UVOT CALDB RELEASE NOTE

SWIFT-UVOT-CALDB-06-R03: Filter Transmission Curves

0. Summary:

This product provides the filter transmission curves for the 7 lenticular filters of the UVOT.

1. Component Files:

FILE NAME	VALID DATE	RELEASE DATE	VERSION

2. Scope of Document:

This document contains a description of the filter transmission curve calibration analysis performed to produce the filter transmission curve calibration products for the UVOT calibration database.

3. Changes:

No changes to filter transmission curves.

4. Reason For Update:

A new ground based white filter transmission curve has been produced and added to this document.

5. Expected Updates:

No further updates are expected.

6. Caveat Emptor:

The ultraviolet transmission curves are extrapolated for wavelengths blueward of 1880Å; therefore the profiles of these filters (especially UVW2) may be incorrect leading to over or under estimates of the filter throughput.

7. Data Used:

No in-flight swift data were used.

8. Description of Analysis:

The first step to reproducing the filter transmission curves was to consider the wavelength range of the instrument response. The filter transmission curves could then be recalculated using this range.

8.1. Instrument Response

The instrument response of the UVOT was considered when deciding upon the correct wavelength ranges to use for the filter transmission curves. Figure 1 shows the curve of the overall sensitivity of the photon counting system (the Detector Quantum Efficiency). The dashed line running through the plot shows the wavelength 1600Å. From Figure 1 we see that the appropriate wavelength range to use for the filter transmission curves is 1600Å to 8000Å.

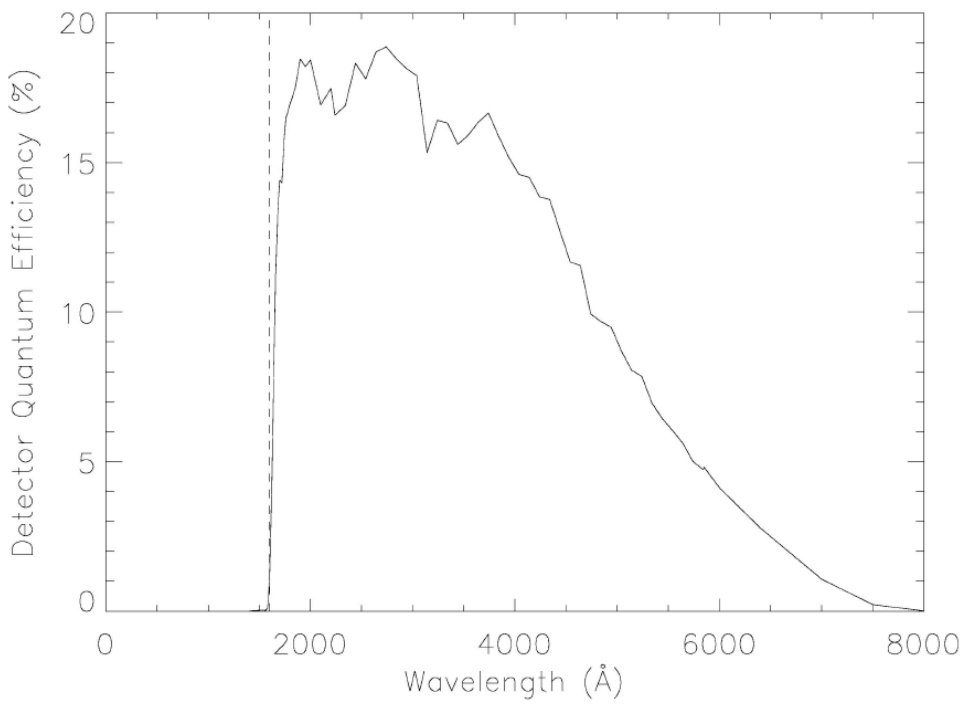

Figure 1 – The overall sensitivity of the photon counting system for UVOT.

8.2. Filter Transmission Curve Extrapolation

The filter transmission curves provided by the manufacturers can be seen in Figures 2 and 3. The optical filters do not have any throughput below 2900Å. The ultraviolet filters have throughput down to 1600Å, therefore the ultraviolet filter curves seen in Figure 2 need to be extrapolated. The white filter transmission given by the manufacturers has to be extrapolated at both ends to cover 1600 to 8000 Å.

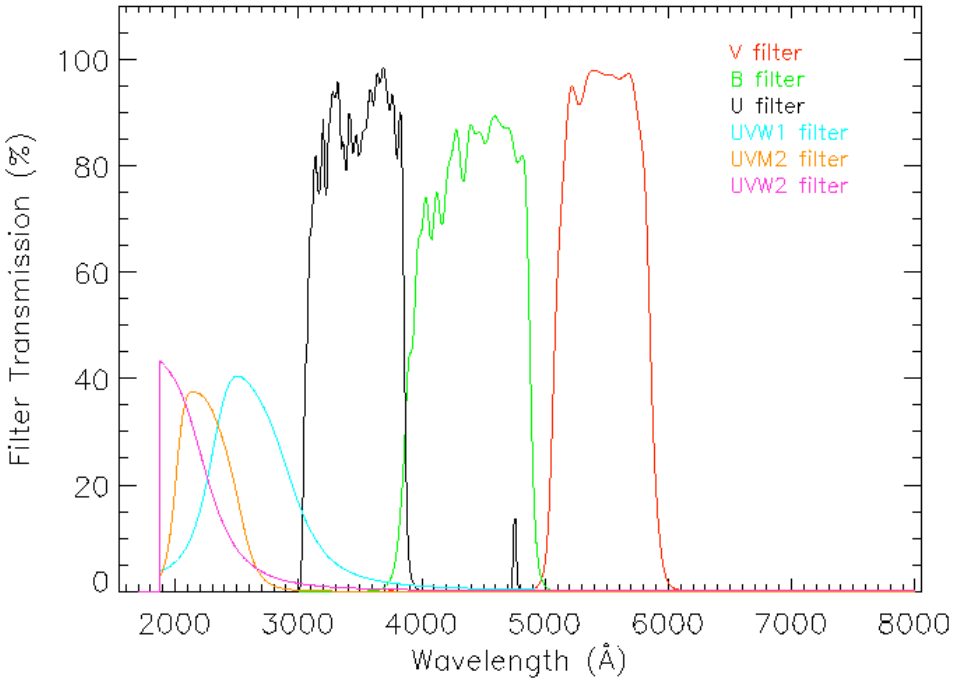

Figure 2 - Filter transmission curves for V, B, U, UVW1, UVM2, UVW2 filters.

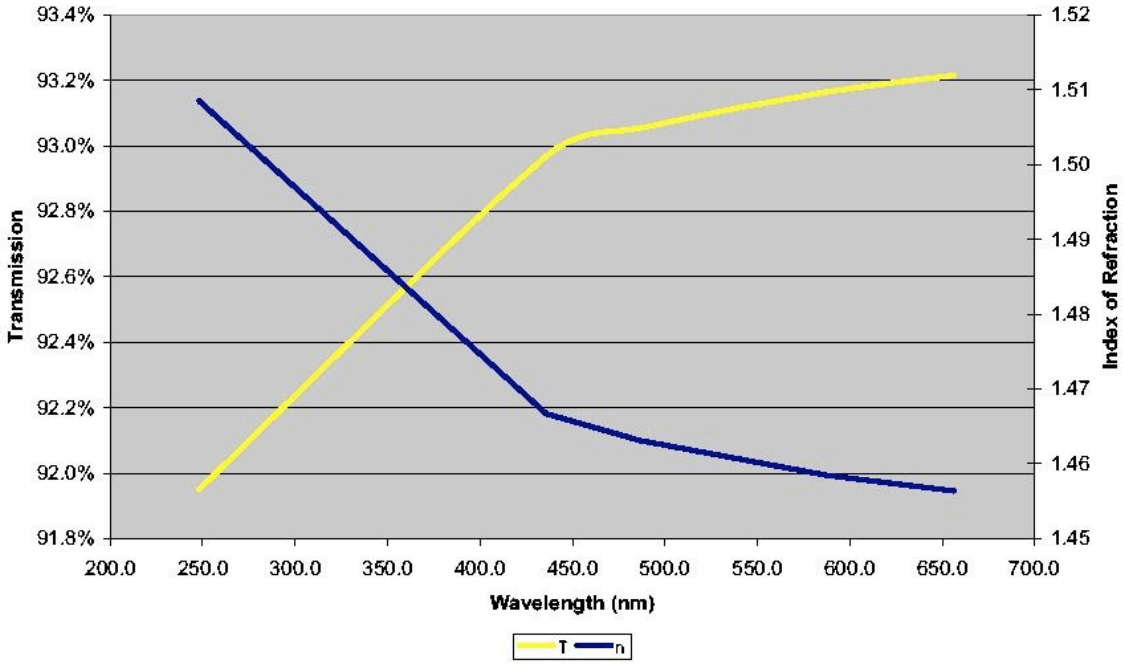

Figure 3 Filter transmission curve (yellow line) for white filter.

The ultraviolet filter transmission curves were extrapolated to 1600Å assuming,

1. The profiles are symmetric about a central wavelength.
2. The UVW2 profile turns over at 1880Å.

The UVW1 filter is almost symmetric and has less than 5% transmission at 1880Å, so the extrapolation gives a good approximation to the profile of this filter. UVM2 is not symmetric but has less than 10% transmission at 1880Å; therefore a small discrepancy between the extracted profile and the actual profile will lead to a small error in the overall throughput. The UVW2 filter extrapolation poses more of a challenge, due to the uncertainty of the position of the central peak. A small discrepancy between the extrapolated profile and the actual profile may lead to a reasonably large error; therefore we caution users when using this throughput.

The white filter transmission curve was extrapolated assuming that the curves continued at the same angle.

The final set of extrapolated filter transmission curves can be seen in Figure 4, where the curves cover a wavelength range of 1600Å to 8000Å.

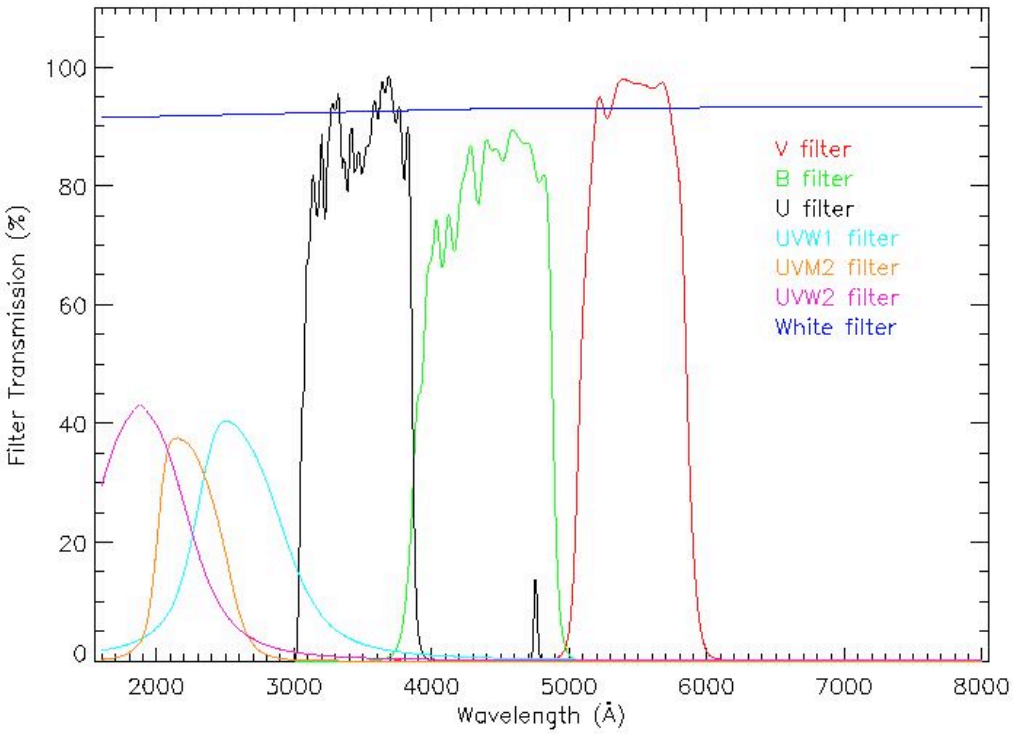

Figure 4 - Updated Filter Transmission Curves for all lenticular filters.