Testing the transmission profile of the new Astrodon Johnson B photometric filter (red-leak suppressed)

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Riassunto. *A test article of the new Astrodon, multi-layer dielectric Johnson B photometric filter has been measured in laboratory to verify the degree of suppression of the red-leak, which is present longword of 10500 Å in current filters. Our measures show that a high degree of suppression has been now achieved: for radiation incident at 90° the residual red-leak peaks to a mere 0.05% at 10,800 Ang. For angles of incidence away from 90°, the red-leak shifts back toward bluer wavelengths as expected, but its amount always remains far less then in current filters. Synthetic photometry tests suggest that over the whole range of explored Kurucz spectra (up to $V-I_C$=+5) the residual red-leak of the new test article filter will cause no sensible effect to observed photometry recorded with conventional optical telescopes and CCDs.*

A test article of the new Astrodon multi-layer dielectric Johnson B photometric filter has been received from Arne Henden (AAVSO), to be tested in laboratory in a way similar to our analysis of photometric filters currently in use within ANS Collaboration (Munari and Moretti, 2012, in Baltic Astronomy, 21, 22). For the tests described in this note we have used the same Perkin Elmer UV-Vis spectrometer Lambda Bio 40 operated by the ARPA laboratory of Forlí (Italy). The filter was measured at room temperature over the whole range from 2000 Å to 1.10 μm, with readings every 10 Å. The light beam had a diameter of 7 mm and was aimed to the geometrical center of the filter.

For reference, Figure 1 presents the result of scanning an old Astrodon multi-layer dielectric Johnson B filter, in use since December 2009 at telescope R122 operated by ANS Collaboration. The scan, under 90° angle of incidence, was performed on May 2010. The presence of a strong red-leak at $\lambda \geq$ 10,500 Å is evident, as a weak spike appearing at 6967 Å. Figure 3 presents the results of scanning this same filter (in September 2011) to investigate the dependence of the transmission profile and the red leak on the angle of incidence of the radiation.

Figures 2 and 4 presents identical plots to Figures 1 and 3 this time for the new (red-leak suppressed) Astrodon multi-layer dielectric Johnson B photometric filter. The high degree of red-leak suppression for light incident at 90° is clearly evident. A residual leak at $\lambda \geq$ 10,500 Å peaks to a mere 0.046% transmission at 10 600 Å. It is also worth noticing that the spike at 6967 Å has now disappeared. The effect of the red-leak for angles of incidence away from 90° is proportionally reduced, being residually present only for deviations $\geq$15° from normal incidence.

Some tests of synthetic photometry has also been carried out adopting sensitivity curves of CCD in normal use for optical observations, typical transmission profiles of telescope optics, and Kurucz synthetic spectra. No noticeable effect has been noted over the explored range of synthetic spectra (up to V-I=+5) for the residual red-leak under 90° incidence of the new Astrodon multi-layer dielectric Johnson B photometric filter.

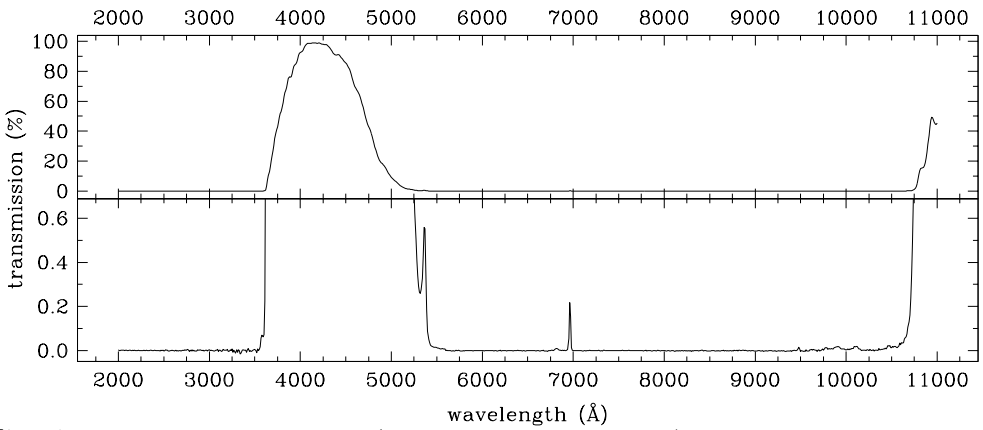

Fig. 1: *Transmission profiles (measured on May 2010) under 90° incident light, for an old Astrodon Johnson B filter in use since December 2009 at ANS Collaboration telescope R122.*

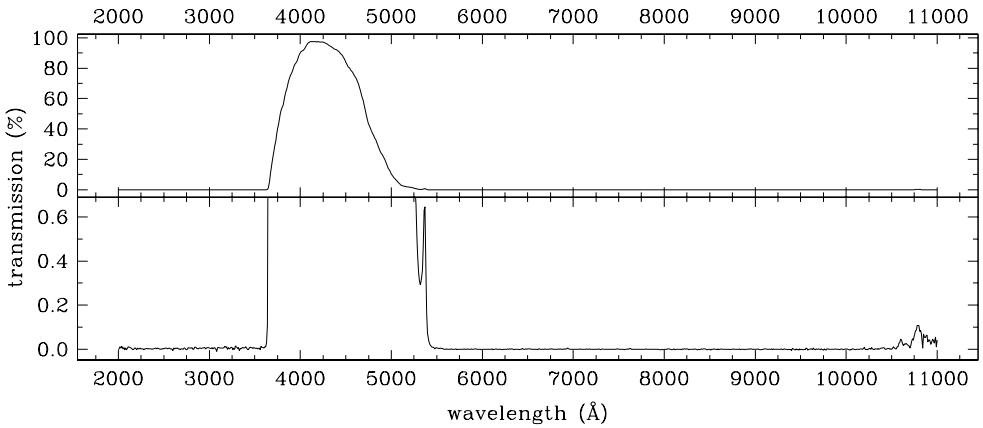

Fig. 2: *Transmission profiles (measured on April 2012) under 90° incident light, for a test article of the new Astrodon Johnson B filter (red-leak suppressed).*

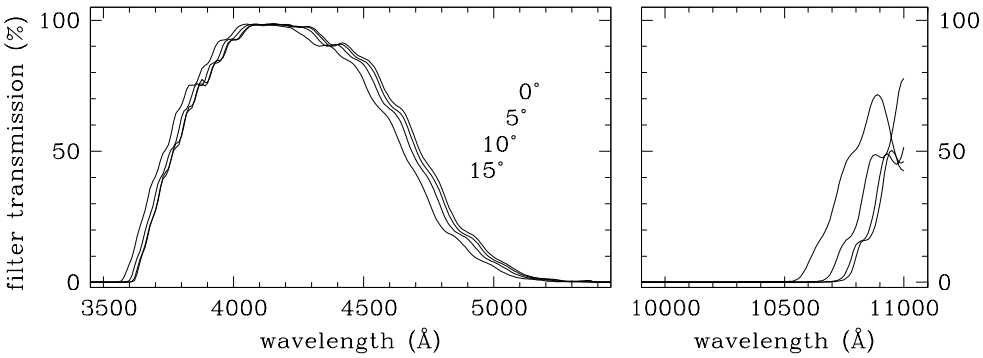

Fig. 3: *Transmission profiles (measured on September 2011) under various angles of incidence of the light beam (expressed as deviations from 90° normal incidence), for an old Astrodon Johnson B filter in use since December 2009 at ANS Collaboration telescope R122.*

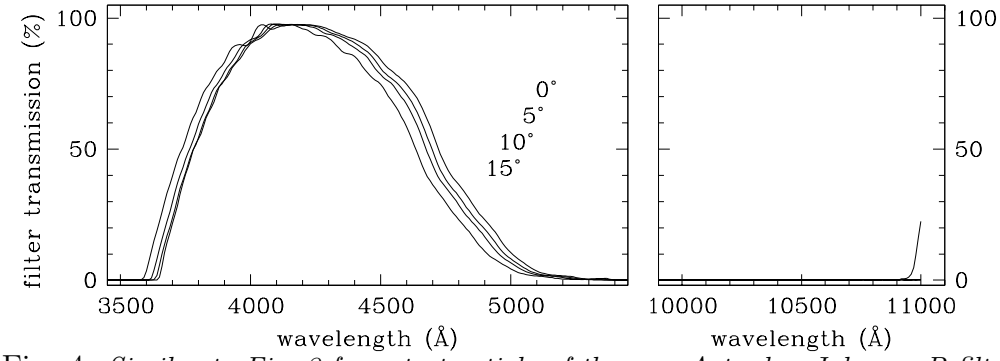

Fig. 4: *Similar to Fig. 3 for a test article of the new Astrodon Johnson B filter (red-leak suppressed) measured on April 2012.*