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IUE DATA REDUCTION

XIV. Properties of the Upper Levels of the Intensity Transfer Functions: Extracted DN Values Relevant to Low Dispersion Spectra

In Memo XIII of this series, the photometric problems resulting from the inadequacies of the current intensity transfer functions (ITF) and the methods chosen to ameliorate these problems (extrapolation of the ITF) were described. In this memo we present detailed measurements of the DN values of the upper several ITF levels for each camera, extracted from the portion of the tube corresponding to the low dispersion spectral orders (both apertures). Such data are of use to those investigators who wish to determine which spectral regions were subject to the inaccuracies inherent in the use of the old photometric correction program FICOR5 (see memo XIII in NASA IUE Newsletter No. 8) and how much extrapolation is done by the new photometric correction program FICOR6 in these spectral regions.

We have derived the DN values in the upper ITF levels corresponding to various low dispersion wavelengths by extracting "spectra" from the averaged ITF component levels in the following way. Each selected ITF level (top 6 in SWP, top 5 in LWR) was processed with the double-aperture point-source low dispersion extraction scheme (slit HT=9) except that the geometric correction step was omitted (since the ITF component levels are already geometrically corrected) and the photometric correction step was likewise omitted (since DN, not FN, values were desired). Also, the extracted, slit-integrated, DN values were normalized to mean single-pixel values by dividing by the slit area (17 pixels). The resulting "spectra", referred to as "DN extractions" are convenient tools for analyzing the limitations of the current photometric correction procedure as it applies to low dispersion spectra, since a mean DN level per pixel is given for each extraction sample. The current mean dispersion constants (see memo XI in NASA IUE Newsletter No. 7), with no zero-point shifts, were used to extract these data.

Figures 1-4 display the plots of the DN extractions made for each aperture and each camera. For SWP, the top 6 levels were extracted: 160%, 140%, 120%, 100%, 80%, and 60% exposures. For LWR, the top 5 levels were extracted: 200%, 160%, 140%, 120% and 100% exposures. The figures illustrate the variation in tube sensitivity along the low dispersion orders and the way in which this variation differs between the two cameras. The points plotted with the symbol "X" indicate, as always, the presence of a reseau. The large number of regions so marked results from the fact that both reseaux affecting the "gross" spectrum and reseaux affecting the "background" spectrum are marked. This is potentially useful information since the regions of reseaux in the ITF component images have been replaced with a smoothly interpolated DN value, in effect "removing" the reseaux. (See discussion of the program REMRES in CSC/TM-77/6250 "IUE Image Processing Overview and Mathematical Description.")

The extracted DN values for the top level in each camera corroborate the approximate DN values measured from box-averaged listings by A. V. Holm. (See NASA IUE Newsletter No. 7, p. 33). With the present technique, finer resolution is possible

and a number of interesting structures are visible, as are differences between the ITF components for the two apertures. Note particularly the sharp features in the LWR levels at $\lambda \sim 2320$ Å and $\lambda \sim 2780$ Å. Such spectral regions are particularly sensitive to signal-to-noise degradation due to slight geometric mis-registration between a target image and the ITF. The generally noisy nature of the LWR response between about 2100 Å and 2900 Å is apparent in Figures 3 and 4 and leads to the frequent instances of high noise levels which are seen in photometrically corrected LWR images and extracted spectra. Such effects may be alleviated in the future if better geometric treatments based on averaged reseau positions with temperature corrections are employed. Such procedures are currently under study.

B. Turnrose

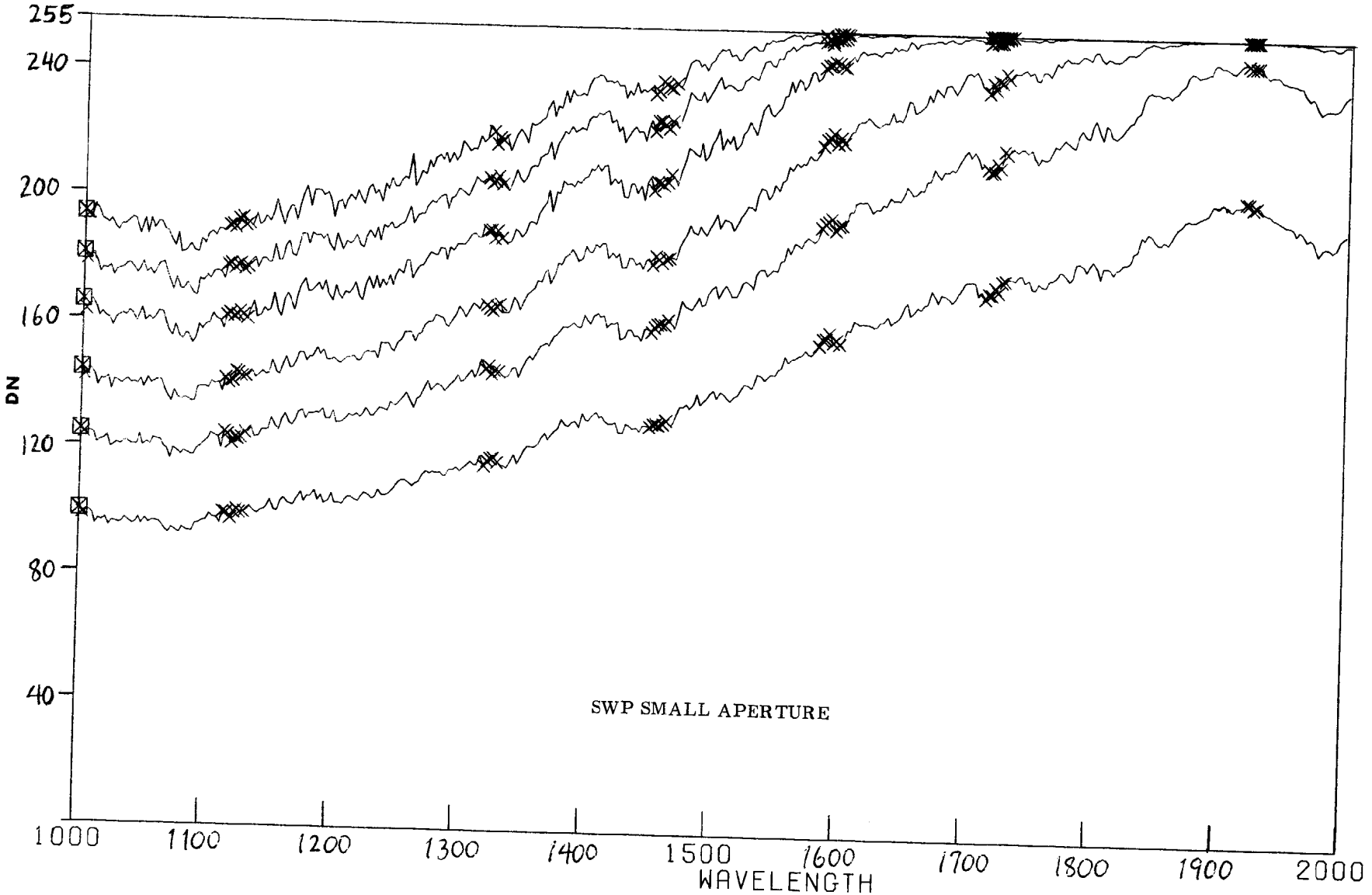

Figure 1 - Extracted DN values for the 6 upper exposure levels of the SWP ITF (small aperture, low dispersion).

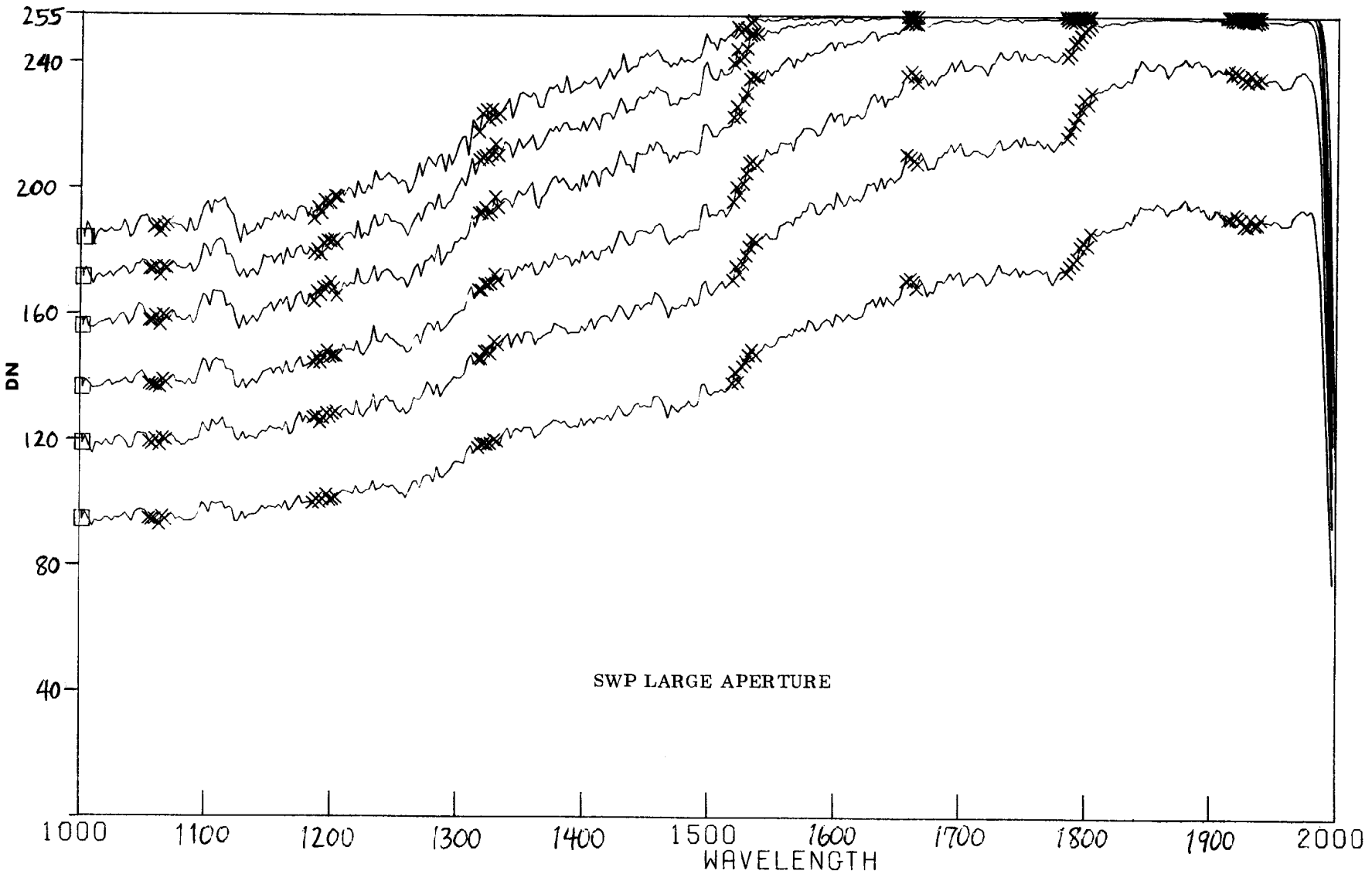

Figure 2 - Extracted DN values for the 6 upper exposure levels of the SWP ITF (large aperture, low dispersion).

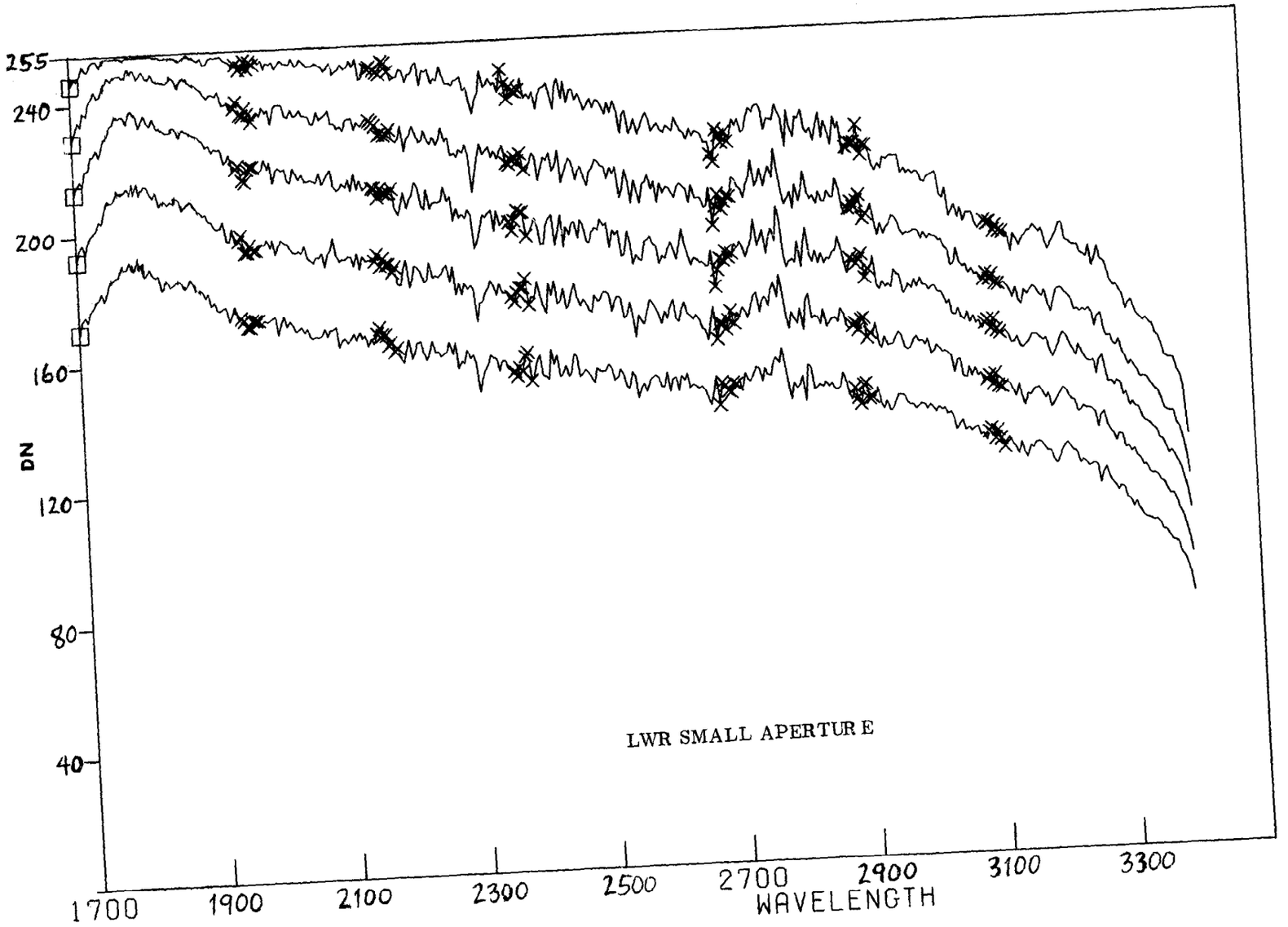

Figure 3 - Extracted DN values for the 5 upper exposure levels of the LWR ITF (small aperture, low dispersion).

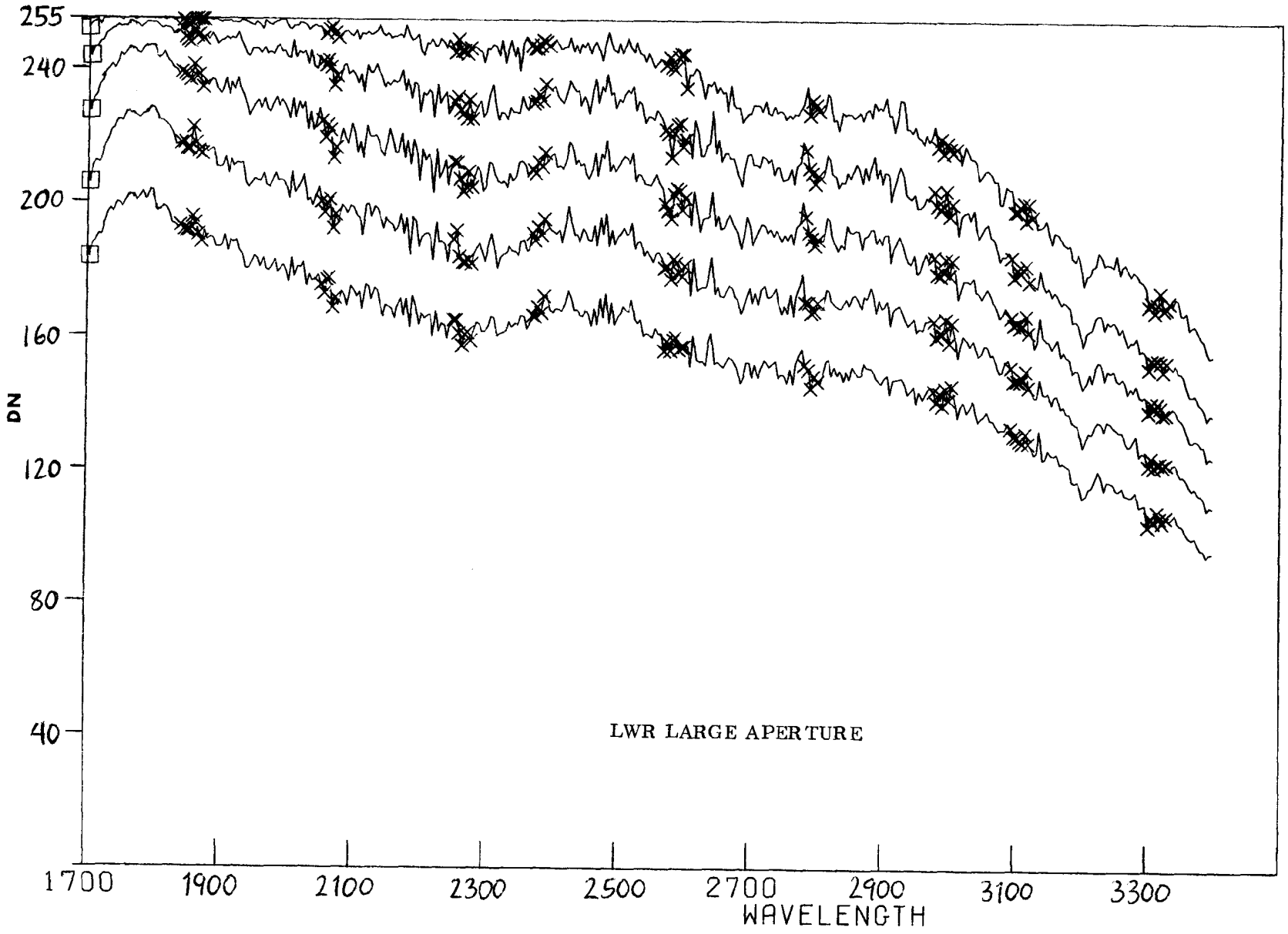

Figure 4 - Extracted DN values for the 5 upper exposure levels of the LWR ITF (large aperture, low dispersion).