Chapter 5 : Direct Imaging- Observing Strategy and Methods

5.1 Principal Goal

In order to search for correlations between time variations in the broad absorption lines and the QSO continuum source, we have monitored the continuum level of BALQSOs using broadband imaging. The method of CCD differential time-series photometry can be used to estimate the *relative* flux of the BALQSO continuum as a function of time. This method uses nearby *comparison stars* as reference points to detect changes in the broadband flux from the QSO. The images of the stars are taken simultaneously with the image of the QSO, thus eliminating large changes in the detector telescope response due to clouds, changing airmass, changes in the point-spread-function (which affects the data reductions), as well as changes in the system response of the CCD and the telescope over the course of months and years. However, there remain some instrumental and environmental effects causing errors which are difficult to entirely eliminate. The cause of these errors and their effects on our final results are discussed in chapter 7.

Based on the availability of observing time on the Lick 1 meter telescope, the size of the sample, previous studies of QSO broadband time variability (see chapter 8), and predictions on the effect of a given change in the continuum on the BALs, we have attempted to achieve a 1σ error in the differential magnitudes of $\sim$0.01 magnitudes (signal-to-noise$\sim$100).

Note that differential CCD imaging photometry of QSOs can achieve accuracies in the relative flux usually a few times better than the typical spectrophotometry of QSOs done at the Lick 3 meter (calibrated with separate observations of secondary standards), and does not require photometric conditions.

However, recent studies have used differential *spectral* monitoring (one comparison star observed simultaneously) to measure time variations QSO emission lines (Maoz *et al.* 1993). This method has advantages (accurate measure of changes in continuum slope)