

WAVELENGTH CALIBRATION CHECK AND ADJUSTMENT OF CD SPECTROPOLARIMETERS

CD spectropolarimeters can be considered as variants of conventional absorption spectrophotometers and same criteria to check and to correct should be used. A recent book: *Burgess C., Frost T., Standards and Best Practice in Absorption Spectrometry, Blackwell Science 1999* includes many important details.

User should however keep in mind that in contrast to modern UV-VIS spectrophotometers, which are based on grating monochromators, most CD spectropolarimeters are still featuring a double prism monochromator. This makes a substantial difference: in grating types there is a direct relation between grating rotation and wavelength, while on prism types the linear wavelength scale is obtained only using a cam system.

Routine diagnostic checks of UV-VIS spectrophotometers are simply measuring the emission line at 656.1 nm of the built in deuterium lamp, a single point calibration is not ideal, but in many cases it can be accepted considering the fact that a second point is easily available: zero order = 0 nm. The quality of the lead screw will determine the errors in between.

With a prism monochromator matter is more difficult and a CD spectropolarimeter has built in a xenon source which emits strong bands over a continuous background. Manufacturers typically suggest the use of didymium glass filters, and instruct to check the position of the 586.5 nm band. In our opinion a single point calibration cannot be considered adequate, so we typically suggest also the use of a holmium glass filter to verify the position of its 360.9 nm sharp peak. While several people reported possible variations in peak positions between different batch of glass, in our experience these two bands are reliable enough, considering the typical bandpass used on CD (1 or 2 nm).

In case of errors exceeding the specifications correction are needed, pls however note:

- perform in advance check of monochromators tracking as from Technical Report N° 7
- prism monochromators are typically more accurate in the UV than in the Visible range (error being proportional to the inverse of the reciprocal linear dispersion)
- so first thing is to check error at 586.5 and 360.9 nm, in most of the cases it's higher at the Vis band
- if so you can correct (it's a delicate adjustment) the length of the scanning arm at 586.5 nm to minimise error
- than you recheck position of 360.9 nm holmium band: it'll be typically within specs, if not it means that you must also correct (typically adjusting reference photosensor position) the angular movement of the cam:
- than you refit the didymium filter and readjust the lever length for 586.5 nm band
- etc etc, up to optimal tuning

Procedure is boring and requires *light hands!*

The spectra below refer to didymium (800-350 nm) and holmium (700-250 nm) glass filters as detected from CH-2 (HT) in a J-600. The sharp bands at 586.5 and 360.9 nm are very clear, other absorption bands may be used too, but region 400-500 nm may result distorted due to emission peaks of the Xe source.

