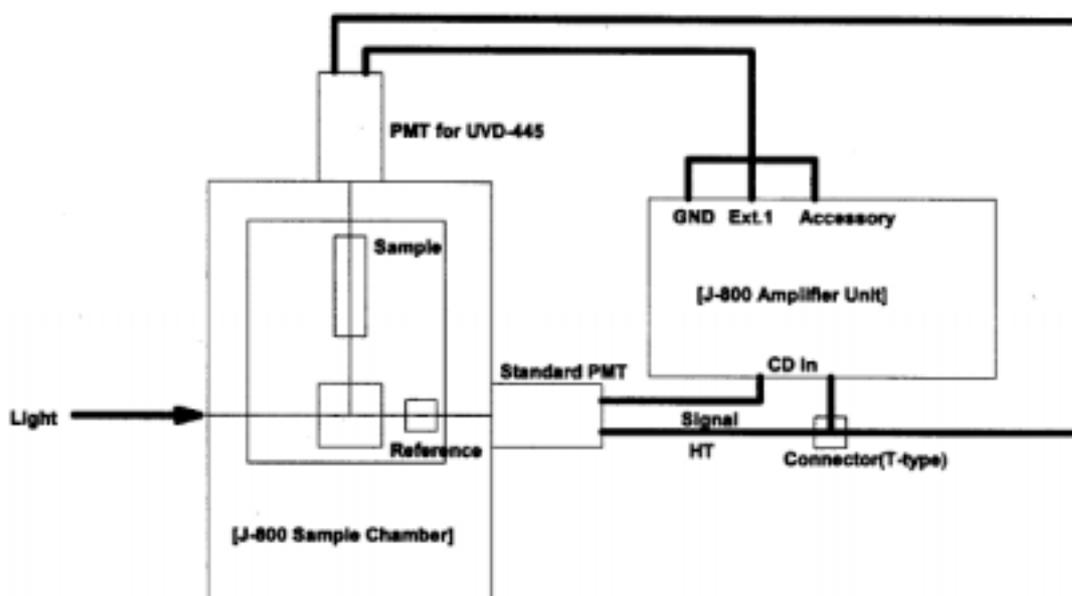


UV-VIS ABSORPTION SPECTRA WITH CD SPECTROMETERS

In a previous report (T.R. N° 1, Feb 2000) we touched already this argument, this time we'll be a bit more specific.

Next picture shows the layout of the optional double beam UV-VIS attachment of the Jasco J-810 (UVD-445)



The layout includes a beam splitter, a second PM tube fitted on the 90° port and necessary wiring. The unit will in this way operate as a double beam/double PM tube detector spectrophotometer, as in early days was the Cary 15. No chopper to modulate light is used so PM tubes *see* continuously SAM and REF beams. Putting a dark target on the beam 0 %T can be finely adjusted by a potentiometer in the electronics. The accessory is simple to operate, but it calls for previous removal of any other sampling accessory and this may be a tedious job. As an alternative a dedicated additional box may be placed in series to std sample compartment to allow its *independent* operation. However real applications are very few: in most of the cases users want to get spectra utilizing same sampling accessories used for CD.

In this respect it pays to consider the standard single beam UV-VIS spectra facilities that are built in the J-810 and comes at no cost.

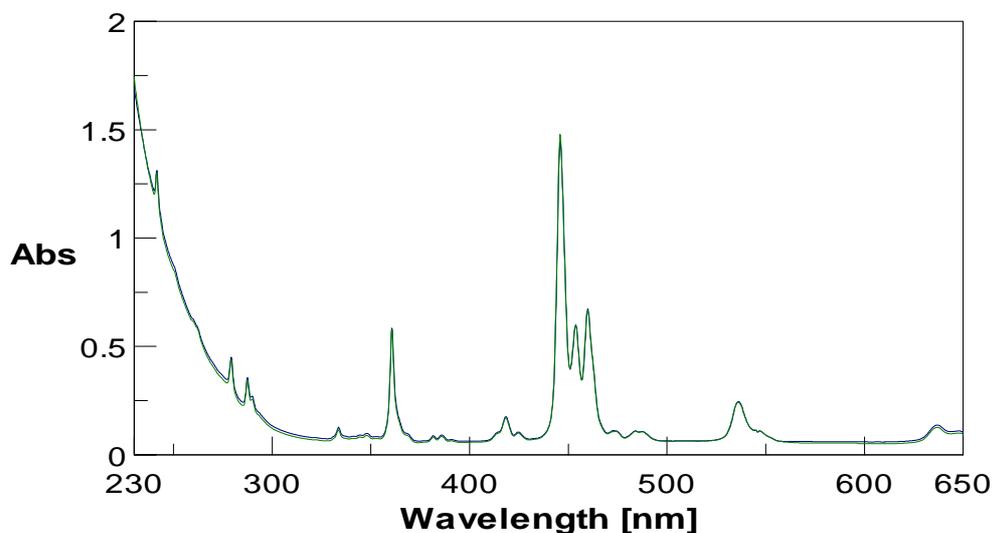
First way calls for collection of CD signal in CH1 and Abs signal in CH2 (you may alternatively collect HT in CH2 and convert it into Abs by software). What you get is a single beam Abs spectra *calculated* from the HT signal that relies on the log response of the PM detector to light level. To obtain double beam alike spectra you run separately sample and solvent and you subtract the files. This approach is very interesting since it's carried on together with CD spectra without any separate run.

Second way calls for collection of the DC signal (UV single) selecting a proper fixed HT voltage on PM tube. Single beam %T spectra will be collected in CH1. Here too separate runs are necessary for sample and blank and proper double beam alike spectra may be obtained by simple post run data processing.

Second approach calls for separate run of CD and absorption spectra, so a longer measuring time is necessary, but absorption spectra may be typically run at higher speed.

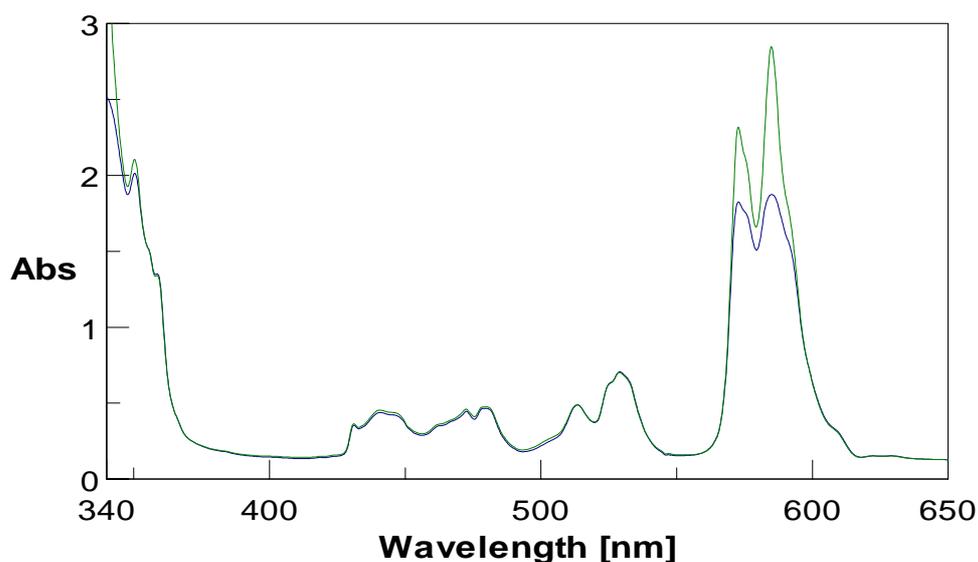
Let's compare spectra obtained with the two methods.

First case is holmium glass filter.



The overlay of the spectra obtained with the two methods is virtually perfect.

Second case is didymium glass filter.

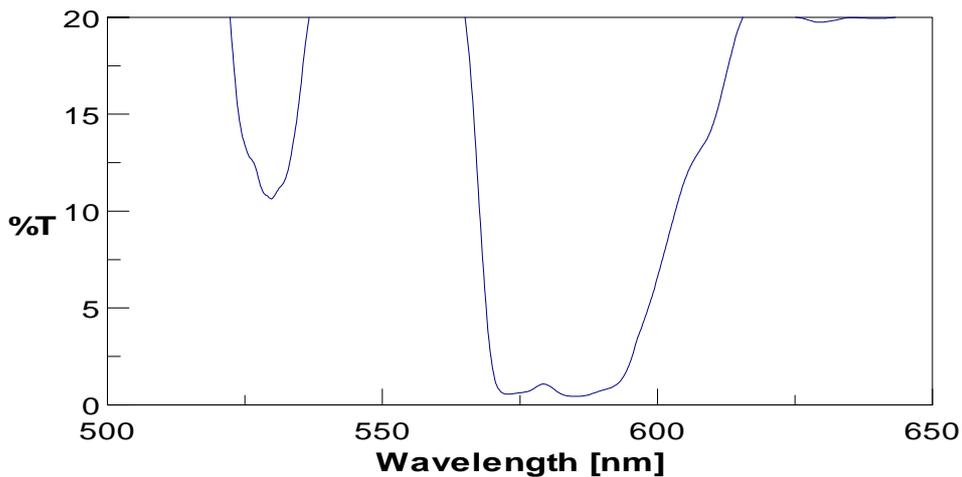


Here too overlapping is good up to nearly 2. O.D., but above this value the first method (converted HT data) is far better than the second one (real %T spectra from DC).

Reason: very simple ... We didn't perform zero %T correction by potentiometer, which is very necessary when high absorbance levels must be quantified.

The same IS NOT necessary extracting Abs data from high voltage applied to PM tube, since in this case by HT we are expanding dynamic range.

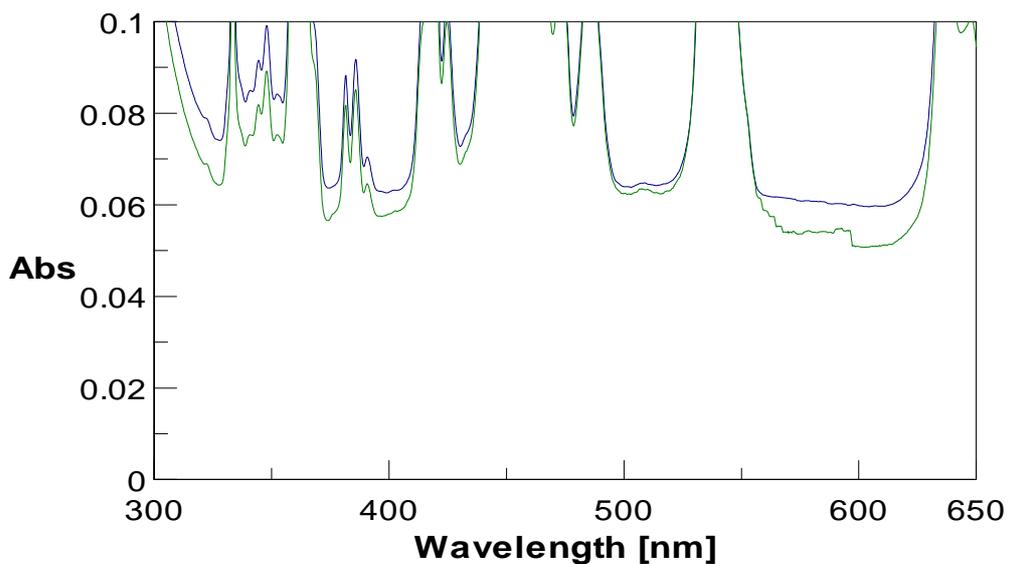
Looking at the expanded single beam %T spectra of the didymium filter clearly indicates where potential problems are



Conclusion:

Direct absorbance measurement (first way) is probably not only the simplest, but also the best way to obtain absorbance spectra from a CD spectrometer.

Second way (which closely emulates a single beam spectrophotometric measurement) has however benefits when band intensities are very weak, as we can easily see observing the expanded spectra of holmium glass reported above.



In any case the use of the double beam accessory (UVD-445) is hardly necessary.