

**SENSITIVITY LIMITS OF CD SPECTROPOLARIMETERS**

Sensitivity of CD spectropolarimeters has always been expressed as RMS noise at different wavelengths. It may be interesting to know how these specs improved with time, let's take Jasco models:

	<i>185 nm</i>	<i>200 nm</i>	<i>500 nm</i>
J-41 (1976)	5 m°	1.5m°	0.6 m°
J-500 (1978)	3 m°	1.5 m°	0.3 m°
J-600 (1986)	0.3 m°	0.2 m°	0.06 m°
J-710 (1990)	0.05 m°	0.04 m°	0.035 m°
J-810 (1999)	0.05 m°	0.04 m°	0.035 m°

All data measured with 1 nm SBW and 4 sec equivalent time constant.

Considering the fact that all these units have same photomultiplier tube (HTV R376), double prism monochromator and Xe source (450W for J-41/500/600, 150W for J-710 and 810), which further comments can we add?

1. big step after J-500 is somehow artificial, since from J-600 on RMS is measured with no sample, while in J-41/500 case was measured with 1 O.D. filter
2. J-600 entrance optics was more efficient than previous models and from this model on MgF2 mirrors have been fitted
3. From J-700 on a new monochromator has been used with far more efficient Nitrogen flushing and somehow higher slits

Common sense is however indicating that we squeezed the lemon at its end, since with current technology not much can be gained. Practical experience indicates that the optimal Nitrogen flushing is probably the key point and that durability is the main issue, substantially improved switching to lower power lamps.

Today competitors' specs are very similar, for example at 185nm¹:

AVIV 202	0.06 m° with 1 nm SBW and 4 sec time constant
J.Y. CD6	0.04 m° with 1 nm SBW and 4 sec integration time
OLIS RSM	0.02 m° with 3 nm SBW and 3 sec integration time
A.P. π* 180	no specs

This doesn't mean that all instruments perform the same, while it should be obvious to everybody that limits will be similar, since based on same technology. My practical experience (in a not far past, when giving many demos for Jasco) running customer samples, even in direct comparison, is that not a single order was lost for sensitivity, but this may be strongly related to operating conditions and skill, as well as proper shape of the unit you are demonstrating.

Last points:

instruments ages, ageing starts from the first time you switch on the lamp. This is very true, mainly in the low UV region. Proper Nitrogen flushing and regular lamp replacement will extend performance lifetime. But degradation is built in! Refreshing optics when necessary with new mirrors ... is a must to keep the necessary sensitivity. To monitor the decay pls keep a record of the high voltage on the photomultiplier tube at given bandpass (once a year, at each lamp replacement or so ...)

¹ Zubritsky E., *Anal. Chem. News & Features*, Aug 1 1999, 545-550A