Subject: Re: IDL FFT (spec -> interferogram)
Posted by Robert Stockwell on Tue, 09 Apr 2002 14:04:39 GMT
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Paul van Delst wrote:

> Robert Stockwell wrote:
>

> However -- and I'm sure you know all this -- in practice, when you compute the flux density
> spectrum from the interferogram, you are not guaranteed to get a spectrum where the imaginary
> part is zero. If the interferogram is perfectly symmetric, sure. In practice, however, IFGs are
> typically asymmetric and this causes the imaginary part to be non-zero.

Ah yes, of course you are correct. For the benefit of any other readers (since Paul already knows this), this non asymmetric interferogram is the typical case for real measurements. That is to say, instead of sampling (ideally) at -2,-1,0,1,2 etc, you get an offset such as samples at -1.8,-0.8,0.2,1.2 etc.
So you in fact sample a symmetric function asymmetrically.

One way of handling this is to record the interferogram on both sides of the ZPD (for a short region) and calculate the spectrum from this "short interferogram", calculate the phase function of the complex valued spectrum, and then calculate the necessary time domain kernel to perform this "phase correction". Often, this kernel is combined with filter functions to get the desired spectrum.

I forget what the original question was, but is that what the point was, how to recover the original symmetric interferrogram from the "unphase corrected" spectrum?

Anyways, this thread reminded me of the good old days of running the Michelson Interferometer measuring the night sky in the infra red, and desperately trying to phase correct an un-phase-correctable instrument (and accepting that we'll have to keep running double sided interferograms), while drinking copious amounts of beer.
Ah to be a grad student again. sigh...

-bob

> Assuming the IFG
> measurement is relatively quick (what you're observing hasn't changed) the IFG asymmetry is due
> to not knowing where the zero path difference (ZPD) occurs (or the lag of the autocorrelation
> is zero). By calculating the phase "error" it's possible to determine the correct ZPD and
> obtain a spectrum with zero (or close to numerical precision).
>

> That's also a reason why, in my examples that Randall mentioned, I'm doing all the spectrum
> folding and what not - I simulate double-sided interferograms rather than single-sided ones.
> Then any gross asymmetry is relatively easy to correct for.
>
> So, with apologies for the ramble, you're absolutely correct - I was just thinking of
> situations with interferometers which I've had to deal with, phase correcting the spectra and
> all.
>
> paulv
>
>
