Subject: Re: IDL FFT (spec -> interferogram)
Posted by Paul van Delst on Mon, 08 Apr 2002 18:36:23 GMT
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Robert Stockwell wrote:
>
> Paul van Delst wrote:
>
>> But one doesn't always want the power spectrum. Usually (in my field at least) one wants the
>> complex valued spectrum where the imaginary component is known and happily zero. (Don't know if
>> Randall wants that tho')
>
>> paulv
>
> isn't that the same thing? (real eq complex with imag=0)
> If the interferrogram is indeed the autocorrelation function,
> then the power spectrum is all you have, you cannot deduce
> any phase info.

First off, I think I slipped up on the terminology. When I saw "power spectrum" I thought |spectrum|^2, but you are correct in that the autocorrelation function of the electric field is the interferogram. What would be the flux density (power spectrum in your terminology) is what I usually call "the spectrum". So I thought you meant the square of what I call the spectrum and....well you see where I screwed up. Ehem.

> Having said that, it is conceivable that one can create a
> complex interferrogram (for instance, combining two different
> channels etc), but in the "usual" (i.e. that I am familiar with),
> an interferrogram is an scalar autocorrelation function.

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. 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

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Religious and cultural
purity is a fundamentalist
fantasy
V.S.Naipaul