

Re: Fourier transform and oscillation amplitude

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Pygmalion wrote:

Howdy mathematicians!

How can one obtain the oscillation amplitude from the Fourier spectrum?
This question is trivial if discrete Fourier transform has value different than zero only for one frequency. However, usually Fourier transform looks something like that:

6.0 Hz – 1 mm
6.1 Hz – 10 mm
6.2 Hz – 40 mm
6.4 Hz – 5 mm

What is the amplitude of oscillation in that case?

If "mm" means "millimeters", that sounds like a strange unit for a Fourier transform.

You are looking at a signal with some bandwidth. You could estimate the total energy in that signal by adding up the energy at each discrete frequency point in the signal (energy is magnitude squared of the FT). This would be the same as the total energy of your original signal.

However, since you have a signal with bandwidth, the relationship between amplitude and energy is not so simple, without additional information. Is it a constant amplitude signal for instance? Is this just a pure sine wave that got spread because the time window was not an integral number of periods?

Finally, there are some arbitrary scale factors that different versions of the FT use.

Probably the best thing for you to do is calibrate your

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FT. Run a signal of known amplitude through it and measure the total energy across the measured band, in your units.

Also, if 40 mm represents a peak, what is a correct name the whole structure?

I've heard "peak". "There is a broad peak at 50 kHz, and a very sharp peak at 35 kHz..." I don't know if there's any formal word in common usage.

– Randy

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