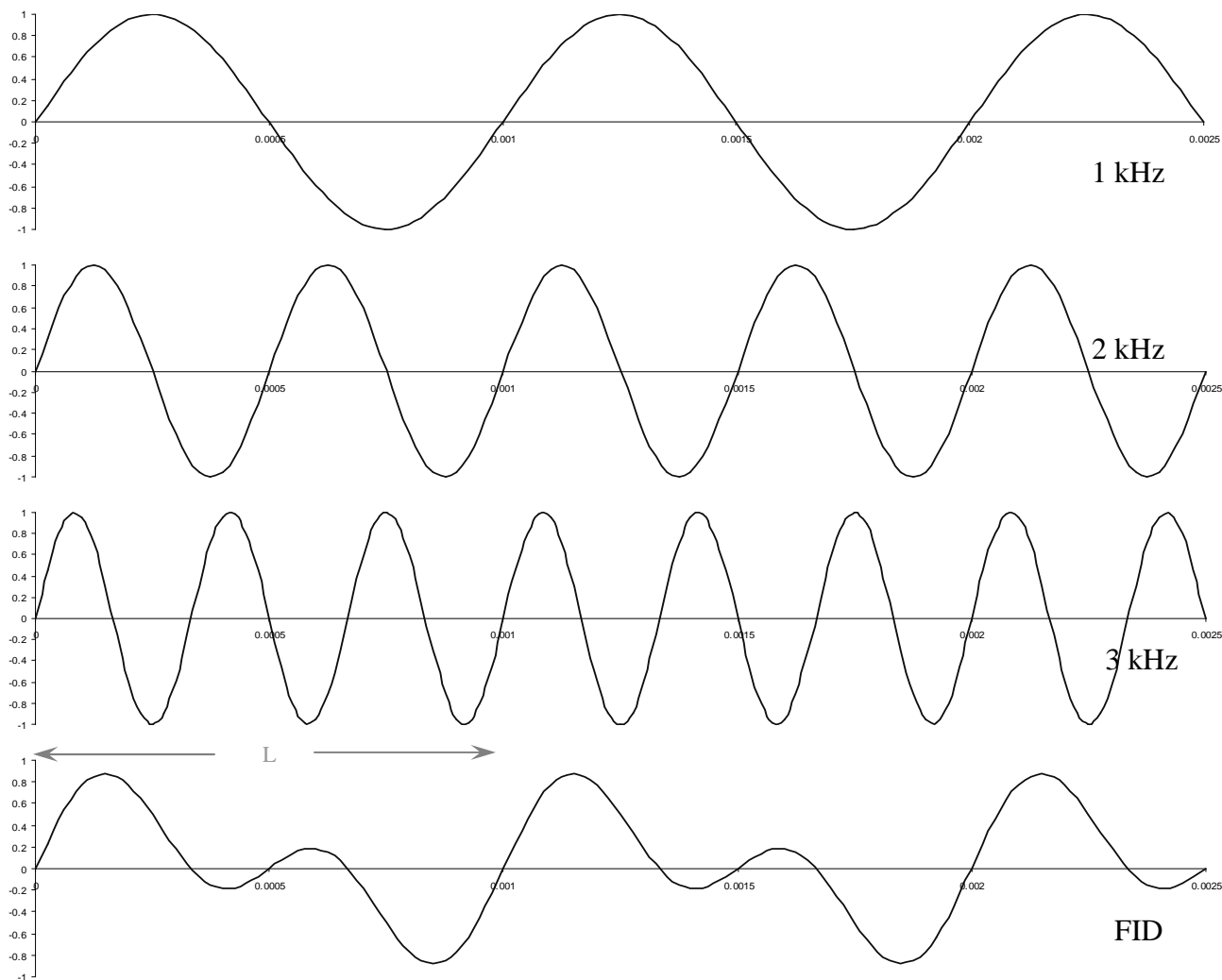


Fourier Transformation

Any periodic wave can be constructed as a sum of sine and cosine waves. The free induction decay, FID, in NMR is a combination of all the line frequencies in the corresponding NMR spectrum.



$$\text{Fourier series: } f(t) = \sum_{n=0}^{\infty} A_n \cos(2\pi n \nu_0 t) + \sum_{n=0}^{\infty} B_n \sin(2\pi n \nu_0 t)$$

with $\nu_0 = \text{lowest frequency} = 1/L$. L is the period.

To find the Fourier coefficients use:

$$A_n = 2 \int_0^L f(t) \cos(2\pi n \nu_0 t) dt$$

$$B_n = 2 \int_0^L f(t) \sin(2\pi n \nu_0 t) dt$$

The FID has Fourier coefficients at 1 and 2 kHz, but not 3 kHz. The spectrum from the FID:

