In real space, we have a resolution dv and bandwidth vmax.

If dv is too small, the signal will be digitized with too few points and the lineshape becomes less smooth. The low resolution causes the FT of the lineshape to be wider than the FT window (w >> xmax = 1/2dv). Because the Fourier Transform is implemented as a Discrete Fourier Transform (DFT), this means that the edges that bleed out of the window need to be folded back in [See previous text].

If the width is larger than the window in real space, the same folding happens when starting from the FT and transforming to real space, see figure 1 black (direct) and blue (inverse DFT).

The linshape that is produced by the IDFT is:

With:

In principle, we could correct the line profile by starting with the exact FT, performing a DFT, and then subtracting the error . The problem is that in real space the lines will be shifted, so this correction is incompatible with the DIT algorithm. To solve this, we must find the FT of in advance, and subtract the error *before* performing the DFT.

The function can be estimated accurately by the following function:

Here the three parameters and are a function of the window width and the linewidth . The strategy is now to fit with , and then we can later use the FT of to correct the FT of the lineshape before transformation to real space. Conveniently, when folding is taken into consideration, the function is the same as the function that has been phase shifted by . The FT can thus be represented by a Lorentzian lineshape with width , with the values alternating (multiplied by +1/-1 for even/odd grid index) which in fourier space implements the necessary shift in real space. The inverse of a constant is an impulse function, so the FT of is represented by updating the value at index 0.