



The  $B_0$  (superconducting magnet) field varies as a function of the position along the sample tube ( $Z$ ) axis. Since the resonance frequency is proportional to field strength, the sample gives a broad range of frequencies in the spectrum for each peak, depending on the position of molecules along the  $Z$  axis. By combining a number of simple functions ( $Z$ ,  $Z^2$ ,  $Z^3$ , etc.) which correspond to coils wound in special ways around the shim stack, and by varying their contributions by adjusting the current applied to each shim coil, a supplementary magnetic field is added which matches the inhomogeneities of the superconducting  $B_0$  field. The sum of these two fields is then constant along the  $Z$  axis, leading to a single sharp resonance frequency for all molecules in the sample.