top of the plot shows the log of the absorptive component of a high resolution numerical simulation, reproducing all features of the data, to the extent that lines are resolved.

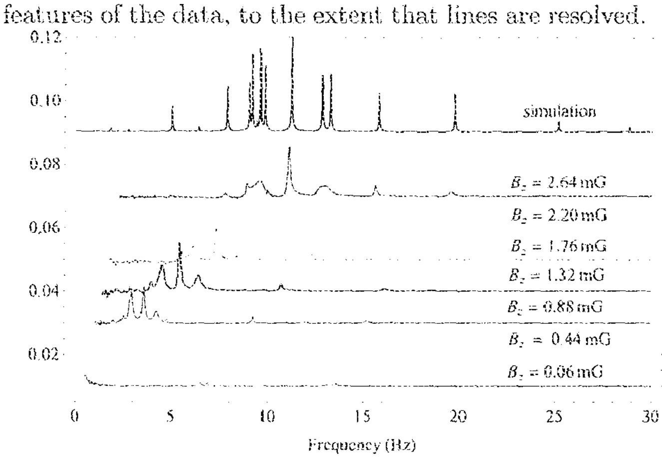

FIG. 5: Experimental spectra for 1-acetic acid, (CH_3 ^{13}COOH) in the indicated magnetic fields. The smooth curve at the top of the plot presents the result of a full numerical simulation with high resolution.

Careful examination reveals 17 lines, 1 for the OH group and $(N+1)^2 = 16$ lines, as theoretically predicted in Ref. [17].

In conclusion, we have investigated near-zero-field nuclear magnetic resonance, where the effects of magnetic fields can be treated as a perturbation to the scalar J-couplings. This work represents a new form of NMR spectroscopy, complementary to high-field NMR, in which heteronuclear scalar couplings are almost always treated as a small perturbation to the dominant Zeeman interaction. We find that the presence of small fields produces splitting of zero-field lines. The splitting patterns have easy-to-understand rules and data are in excellent agreement with the predictions of first-order perturbation theory. It is interesting to note that the phenomenology observed here is similar to that of atomic spectroscopy of multi-electron atoms, and intuition developed in the latter field may be applied to interpretation of NZF NMR spectra. We have also investigated the case where Zeeman and J-couplings are comparable, resulting in signals with much higher complexity, potentially useful for NMR quantum computing [17].

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