Chapter 9

Conclusion

In the course of the present work, an EPR spectrometer operating at a detection frequency of 360 GHz and at magnetic fields of up to 14 T has been built. It utilizes a heterodyne detection scheme and an induction mode setup; for the transmission line quasioptical components and oversized corrugated waveguide were used. Due to its detector configuration it allows for the extension to time–resolved measurements. In addition to the original probehead a second probehead configuration was developed that exhibited greater stability and and an increase in modulation field strength of a factor of 4 for identical conditions. The absolute sensitivity of the spectrometer has been determined to $5 \cdot 10^9$ spins/G for a detection bandwidth of 1 Hz (1G = 0.1 mT).

A complete suite of data acquisition and experiment control routines has been developed. A routine for the simulation of the measured spectra has been written. Together with a least squares fitting routine the measured spectra have been fitted. The spectral parameters thus obtained from the measured samples agree to the literature values to within experimental error.

First experimental spectra have been obtained for a 4–hydroxy–TEMPO and a MTS spin label. With these spectra the expected increase in spectral resolution due to the higher Zeeman field could be demonstrated. A

first experimental spectrum of a spin–labeled protein, the V167C mutant of bacteriorhodopsin has been obtained. A comparison with the free spin label shows the expected shift of the g_{xx}–component of the **g**–tensor.

The current resolution determining factor is the non–linearity of the B–field sweep. Several ways to improve the calibration of the B–field axis have been proposed. The measurements presented have shown that with the high sensitivity which was achieved, once the calibration has been implemented, it will be possible to measure relative g–values of bioorganic molecules with a precision of ± 0.00002 or better and absolute g–values to within the precision of the standard.