

Peculiarities of free induction and primary spin echo signals for spin-correlated radical pairs

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Abstract

Keeping in mind ion-radical pairs in a photosynthesis reaction centre first of all, we calculated free induction and spin echo (ESE) signals for an ensemble of radical pairs which initially start in a singlet state. It was shown that the intensity of signals should oscillate depending on the time interval τ between the start of a pair and a microwave pulse forming free induction (FI) or between the start of a pair and the first of two microwave pulses forming primary ESE signal. ESE phase of spin-correlated pairs does not coincide with the corresponding ESE phase of radical pairs in thermal equilibrium. One should also note an interesting feature of FI: immediately after the microwave pulse free induction signal equals zero, and non-zero free induction signal appears only due to spin evolution. This behaviour formally resembles the situation occurring when the primary ESE is formed: a light pulse which creates spin-correlated radical pairs acts as the first microwave pulse in conventional spin echo experiments. Analysis of FI and ESE in experiments on pulse photolysis or radiolysis may provide useful information about the contribution of spin-correlated radical pairs. © 1992 Springer.

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