Investigation of the dephasing of tunneling systems in glasses using two-pulse polarisation echo experiments

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Low temperature properties of glasses are governed by atomic tunneling systems. Many aspects are well described within the phenomenological standard tunneling model. Via their elastic and electric dipole moments tunneling systems interact mutually and with external fields. The dynamics of tunneling systems can be investigated by two-pulse polarisation echo experiments. Here the echo amplitude is measured as a function of the delay time between the two excitation pulses. Different dephasing mechanism contribute to the decay of the echo amplitude. In amorphous dielectrics at very low temperatures the domiating dephasing mechanism is spectral diffusion, which is the interaction of resonant tunneling systmes with non-resonant thermally fluctuating ones. We have performed such echo decay measurements with an improved setup allowing us to observe echoes at very long delay times where the echo has decayed five orders of magnitude from its original amplitude. The data obtained in this way allwos a precision test of the model of spectral diffusion and the distribution of parameters of the tunneling systems given by the standard tunneling model. We will show experimental results form measurment on BK7 and will discuss them in the framework of spectral diffusion and the standard tunneling model.