

Quantum dynamics of the Stern-Gerlach (S-G) effect

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Abstract. A quantum dynamical treatment of the S-G effect, to the leading order in $|e|\hbar/c \equiv \sqrt{\alpha}$ for the electron, where α is the fine-structure constant, and for spin 1/2 charged particles (*e.g.*, the proton), in general, leads to a unitary expression for the probability density on the observation screen, where the magnetic field has a controllable longitudinal uniform component along the initial average direction of propagation of the particle, in addition to a non-uniform, almost longitudinal, magnetic field lying in the plane defined by the quantization axis, in question, of the spin and the initial average direction of propagation.