Q 52: Poster Materiewellenoptik

Zeit: Donnerstag 16:30–19:00 Raum: Poster C2

Q 52.1 Do 16:30 Poster C2

Berry phase in atom optics — •Polina V. Mironova, Maxim A. Efremov, and Wolfgang P. Schleich — Institut für Quantenphysik, Universität Ulm, Ulm, Germany

We suggest a scheme to observe the Berry phase using the atomic external degrees of freedom. We consider two consecutive interactions of an atom with a near-resonant standing light waves. An atom is scattered by a standing wave, which is formed by two red-detuned traveling light waves, $\Delta < 0$, with wave vectors $\mathbf{k}_1$ and $\mathbf{k}_2$, $|\mathbf{k}_1| = |\mathbf{k}_2| = k$, $\angle(\mathbf{k}_1, \mathbf{k}_2) = 2\alpha$. Afterwards, the atom is scattered by a second standing wave, which is formed by two blue-detuned traveling light waves, $\Delta > 0$, with wave vectors $\mathbf{k}'_i/|\mathbf{k}'_i| = -\mathbf{k}_i/|\mathbf{k}_i|$, $i = 1, 2$. We assume that both interactions turn-on and turn-off adiabatically. Within the rotating wave approximation and the adiabatic approximation on the atomic center-of-mass motion we obtain that the final state of the atom differs from the initial state of the atom only by twice the familiar Berry phase, which depends on the atomic external degrees of freedom. The dynamical phase is cancelled out and the scattering picture is determined only by the atomic center-of-mass position.