

## MO 12: Kalte Moleküle 3

Zeit: Dienstag 16:30–17:00

Raum: VMP 6 HS-G

MO 12.1 Di 16:30 VMP 6 HS-G

**Shaking of Feshbach molecules by nonresonant fields** —  
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We propose to probe weakly-bound Feshbach molecules, both homo- and heteronuclear, by “shaking.” This is based on the idea that a laser field can impart a tunable value of angular momentum to a molecule, via the interaction of the molecule’s anisotropic polarizability with the laser field. Thereby, a centrifugal term is introduced that can be set to a critical value sufficient to push the highest vibrational level of a Feshbach molecule out of the potential that binds it. The value of the critical angular momentum changes characteristically with internuclear distance. This can be used to map out the vibrational wavefunction of the highest vibrational state, by measuring the dissociation probability as a function of the intensity of a pulsed laser whose pulse duration is much shorter than the vibrational period. In turn, the vibrational eigenfunction can be inverted to yield the molecular potential with a high accuracy. We carried out numerical calculations for  $\text{Rb}_2$  and  $\text{KRb}$  molecules using accurate potential energy surfaces and developed an analytic model of “dissociation by shaking” for several exactly solvable potentials. We note that the laser field of an optical dipole trap may

actually be dissociating some of the most weakly bound molecules via the “shaking” mechanism.

MO 12.2 Di 16:45 VMP 6 HS-G

**Near-threshold quantization in two and three dimensions** —  
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The interactions between atoms and molecules with each other and with surfaces are typically deep potential wells with attractive tails behaving asymptotically as an inverse power of the distance. In such potential wells, bound state energies  $E_n$  are determined by a quantization function  $F(E)$  according to  $n_{\text{th}} - n = F(E_n)$ , and  $F(E)$  is dominantly determined by the singular potential tail for near-threshold states. We present general expressions for the contribution  $F_{\text{tail}}$  of the singular potential tail to the quantization function for near-threshold energies in two and three dimensions. For homogeneous potential tails proportional to  $-1/r^\alpha$ , analytical formulas for  $F_{\text{tail}}$  are given and we show the connection between the scattering length  $a$  and near-threshold energies  $E_n$ . In three dimensions we furthermore present an interpolated formula for the tail contribution for arbitrary energies and we demonstrate how the dissociation energy of a diatomic molecule can be determined from spectroscopic energies of high-lying states.