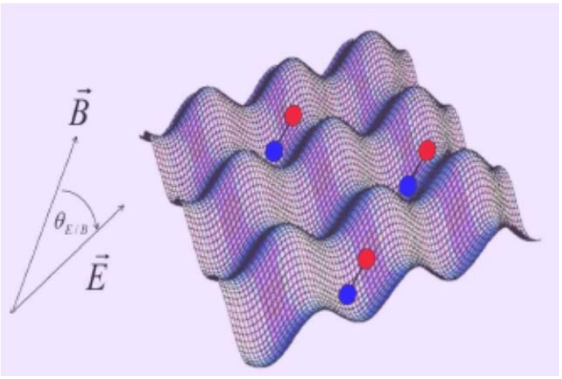
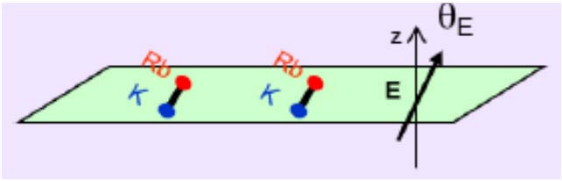
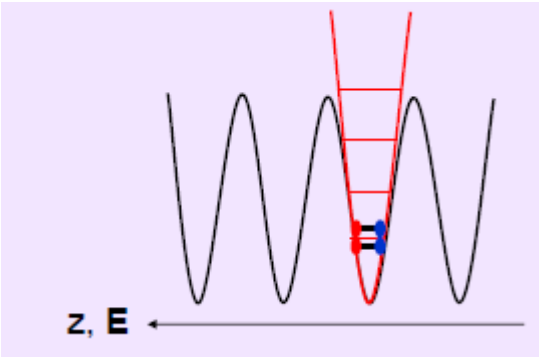
Ultracold collisions between dipolar particles in tilted field and external confinement





Polar molecules in external field= interacting induced (aligned) dipole moments



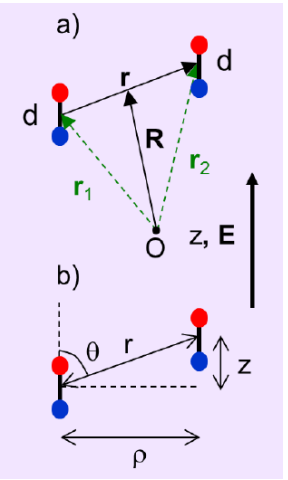
1D harmonic oscillator

$- V_{ho} = ½ m_1 \omega^2 z_1^2 + ½ m_2 \omega^2 z_2^2$

$\rightarrow$ quantum number n_1, n_2

Wavefunctions in spherical coordinates

$$\psi(\vec{r}) = \sum_{l,m_l} \frac{1}{r} F_{l,m_l}(r) Y_l^{m_l}(\theta,\varphi)$$



$$V = V_{vdW} + V_{dd} + V_{ho} = -\frac{C_6}{r^6} + \frac{d^2(\theta_E)(1-3\cos^2(\theta))}{4\pi\varepsilon_0 r^3} + \frac{1}{2}\mu\omega^2 z^2$$

$$\left(-\frac{\hbar^2}{2\mu}\frac{\partial^2}{\partial r^2} + \frac{\hbar^2 l(l+1)}{2\mu r^2} - \frac{C_6}{r^6} - \frac{C_3(l,m_l,l,m_l)}{r^3} + \langle l,m_l|\, V_{ho}|l,m_l\rangle - E_c\right) F_{l,m_l}(r)$$
$$+ \sum_{l'\neq l,} \langle l,m_l|\, V_{ho}|l',m_l\rangle\; F_{l',m_l}(r) + \sum_{l',m_l'\neq l,m_l} \left(-\frac{C_3(l,m_l,l',m_l')}{r^3}\right) F_{l',m_l'}(r) = 0$$

Théomol