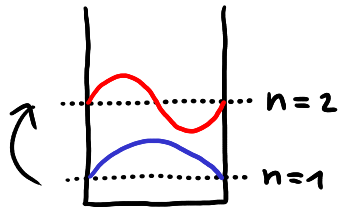
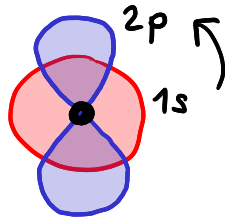


# Nestacionární poruchová teorie

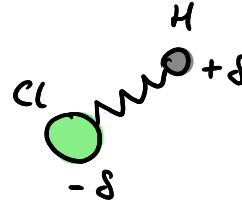
- studium přechodů v kvantověmechanickém systému vyvolaných vnějšími vlivy



kvant. jáma



atom vodíku



molekula HCl

$$n = 1, l \neq 1$$

$$\uparrow$$

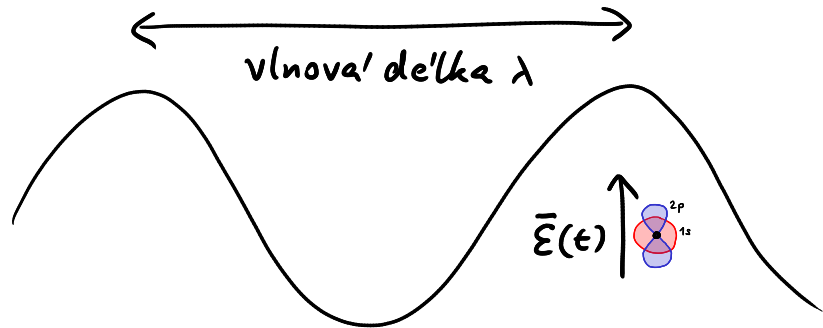
$$n = 0, l$$

- porušený Hamiltonián

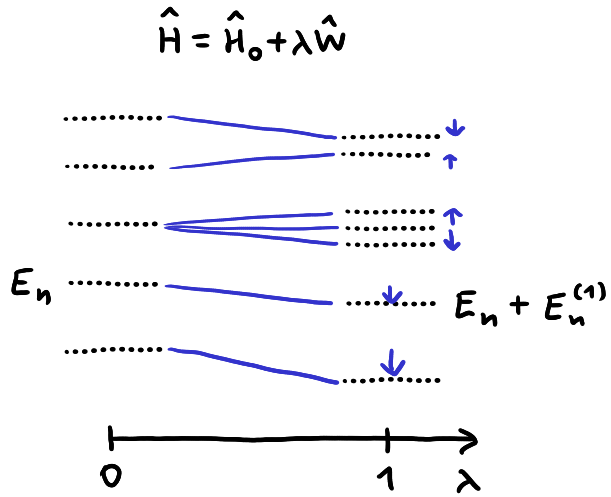
$$\hat{H} = \hat{H}_0 + \hat{W}(t)$$

EM pole světelné vlny

$$\hat{W}(t) = e E_0 \hat{z} \cos \omega t$$



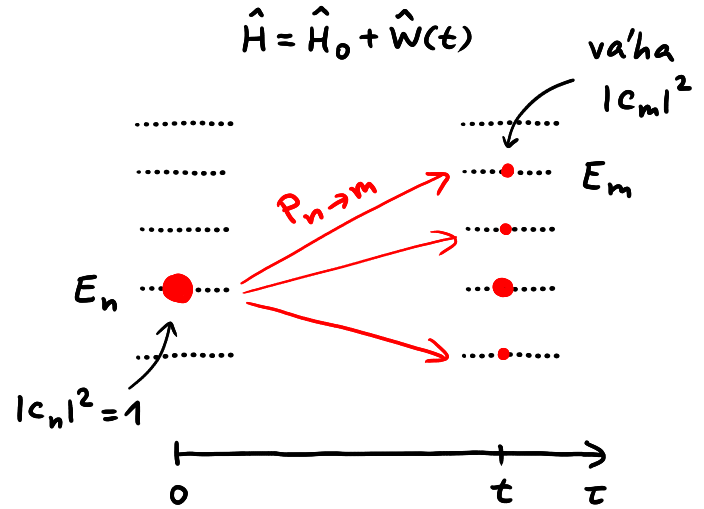
# Srovnání stacionární a nestacionární poruchové teorie



korekce vlastních energií (posuvy a štěpení)  
narůstající při postupném zapínání poruchy  
až na její plnou sílu

$$E_n^{(1)} = \langle n | \hat{W} | n \rangle$$

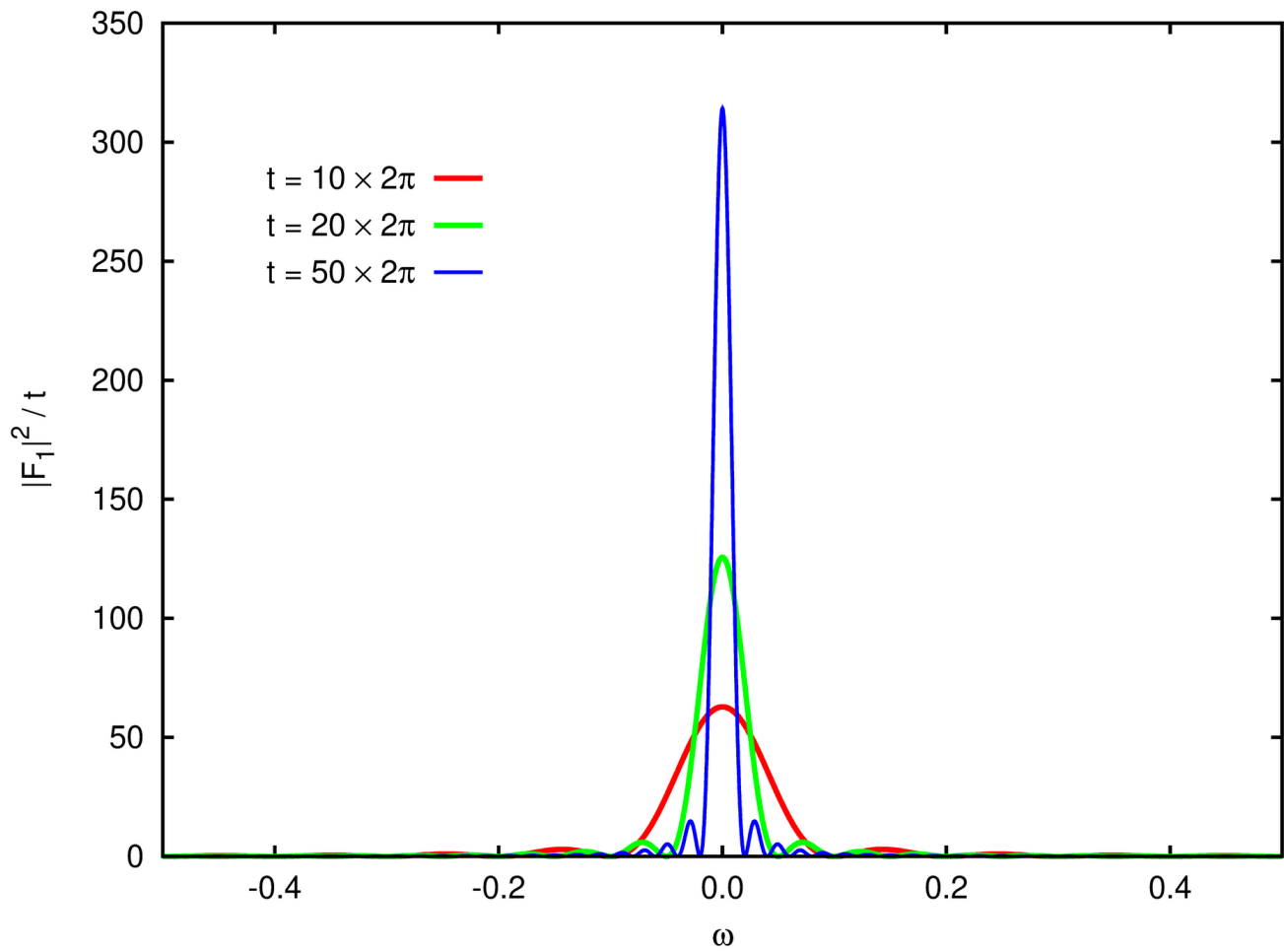
$$|n\rangle \rightarrow |n\rangle - \sum_{m \neq n} |m\rangle \frac{\langle m | \hat{W} | n \rangle}{E_m - E_n}$$

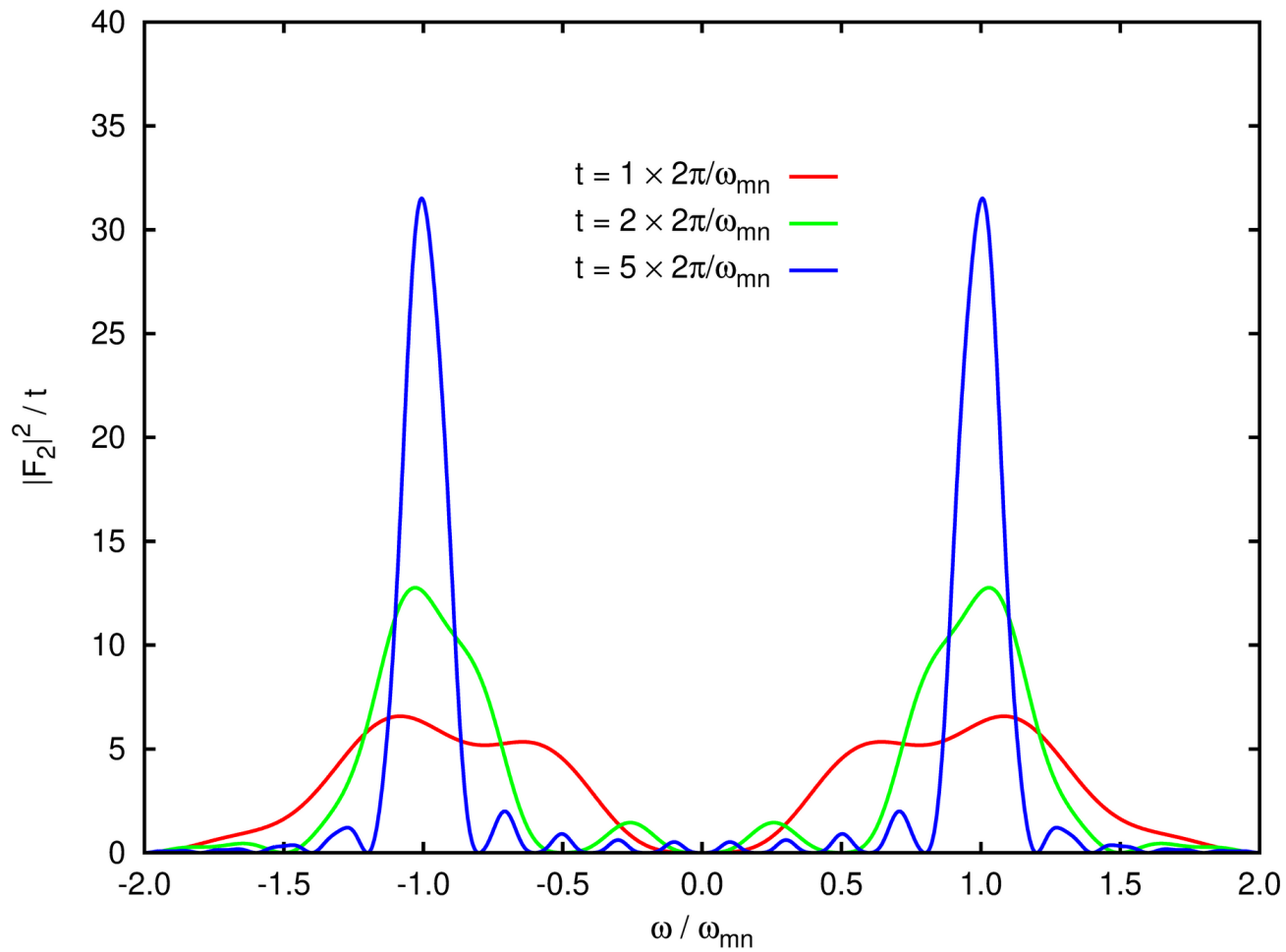


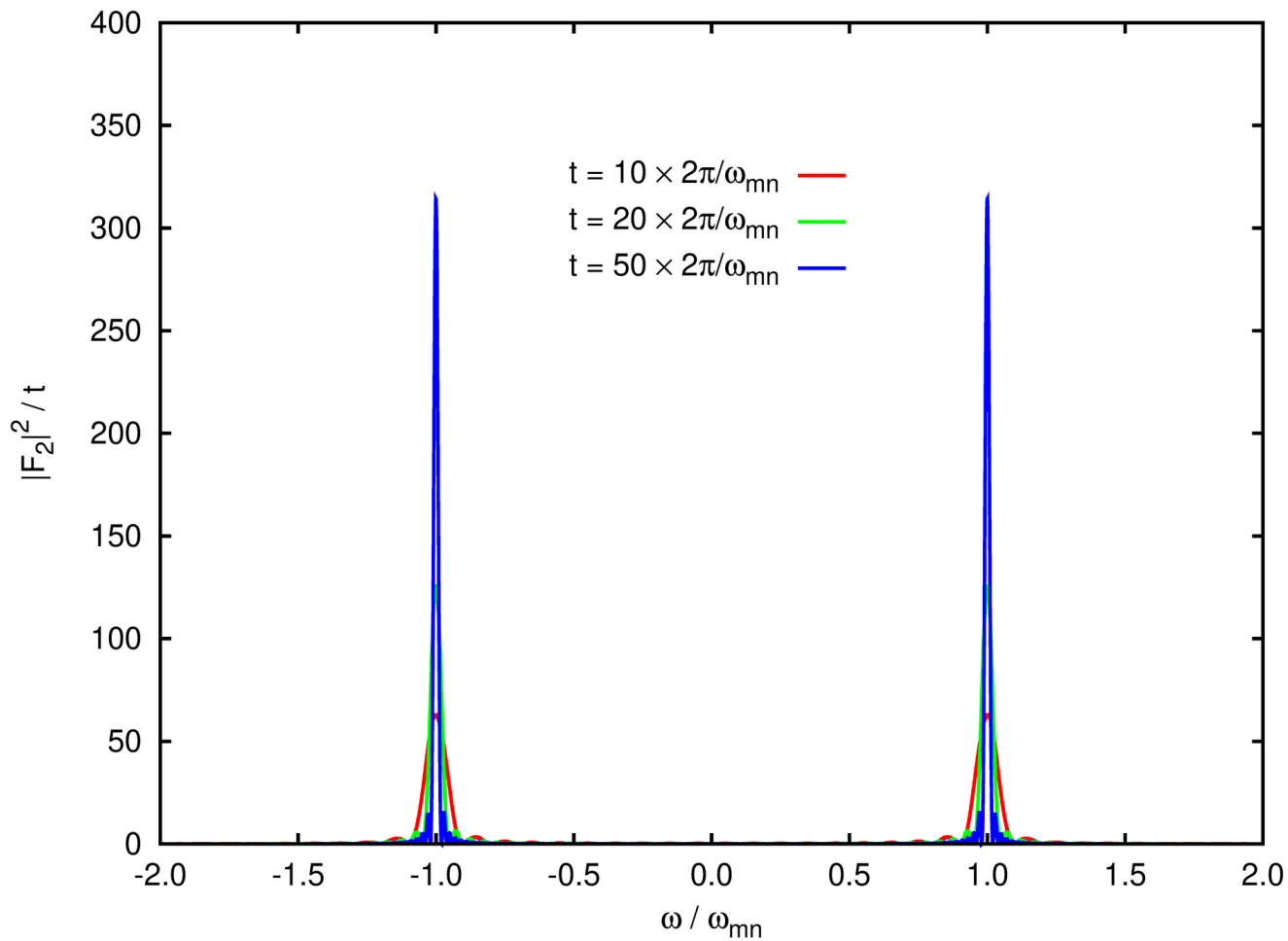
přechody mezi vlastními stavy  $\hat{H}_0$  podnětované  
poruchou, charakterizované časově závislými  
pravděpodobnostmi přechodů

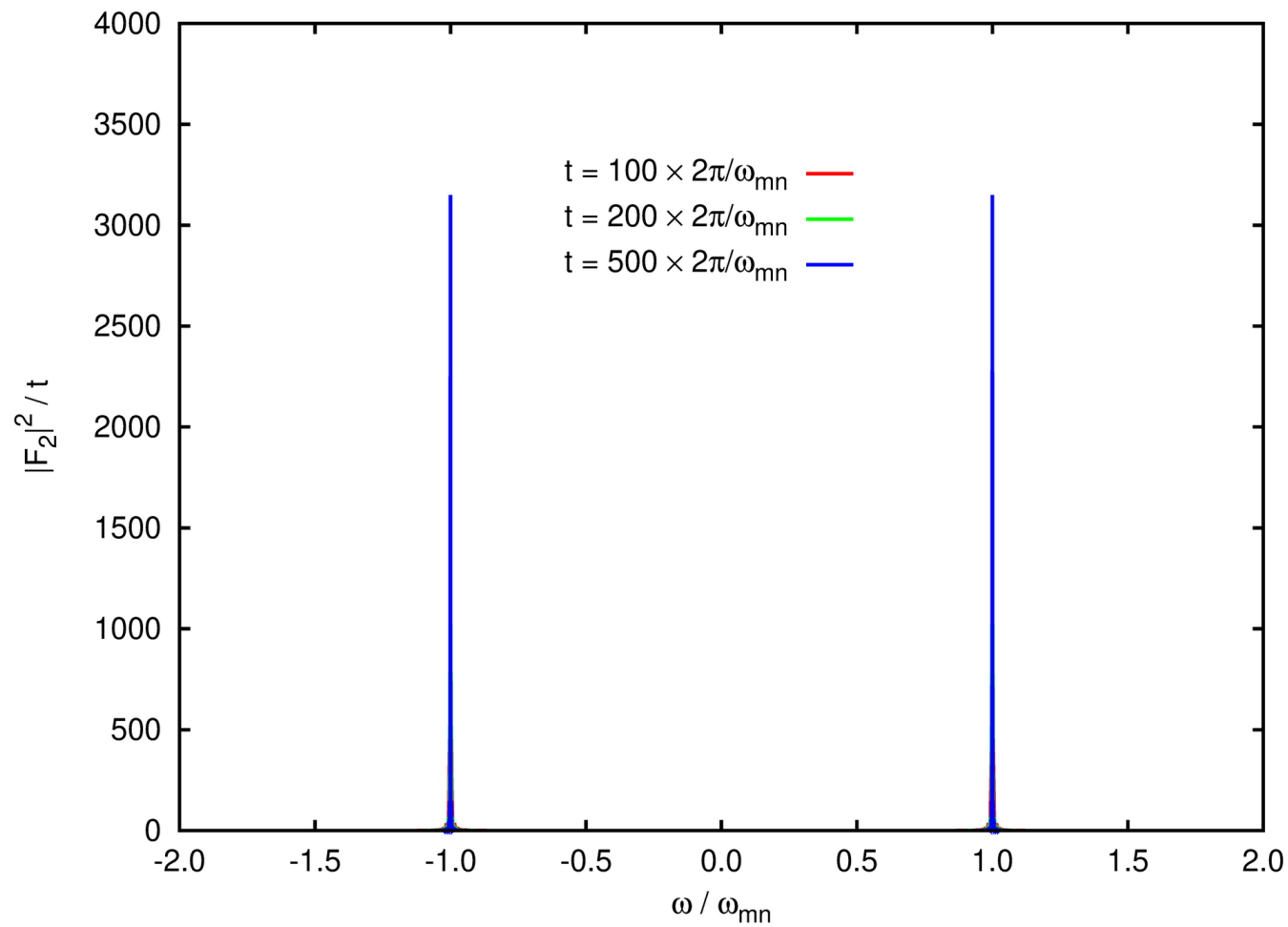
$$c_m(t) = \frac{1}{i\hbar} \int_0^t \langle m | \hat{W}(z) | n \rangle e^{\frac{i}{\hbar}(E_m - E_n)z} dz$$

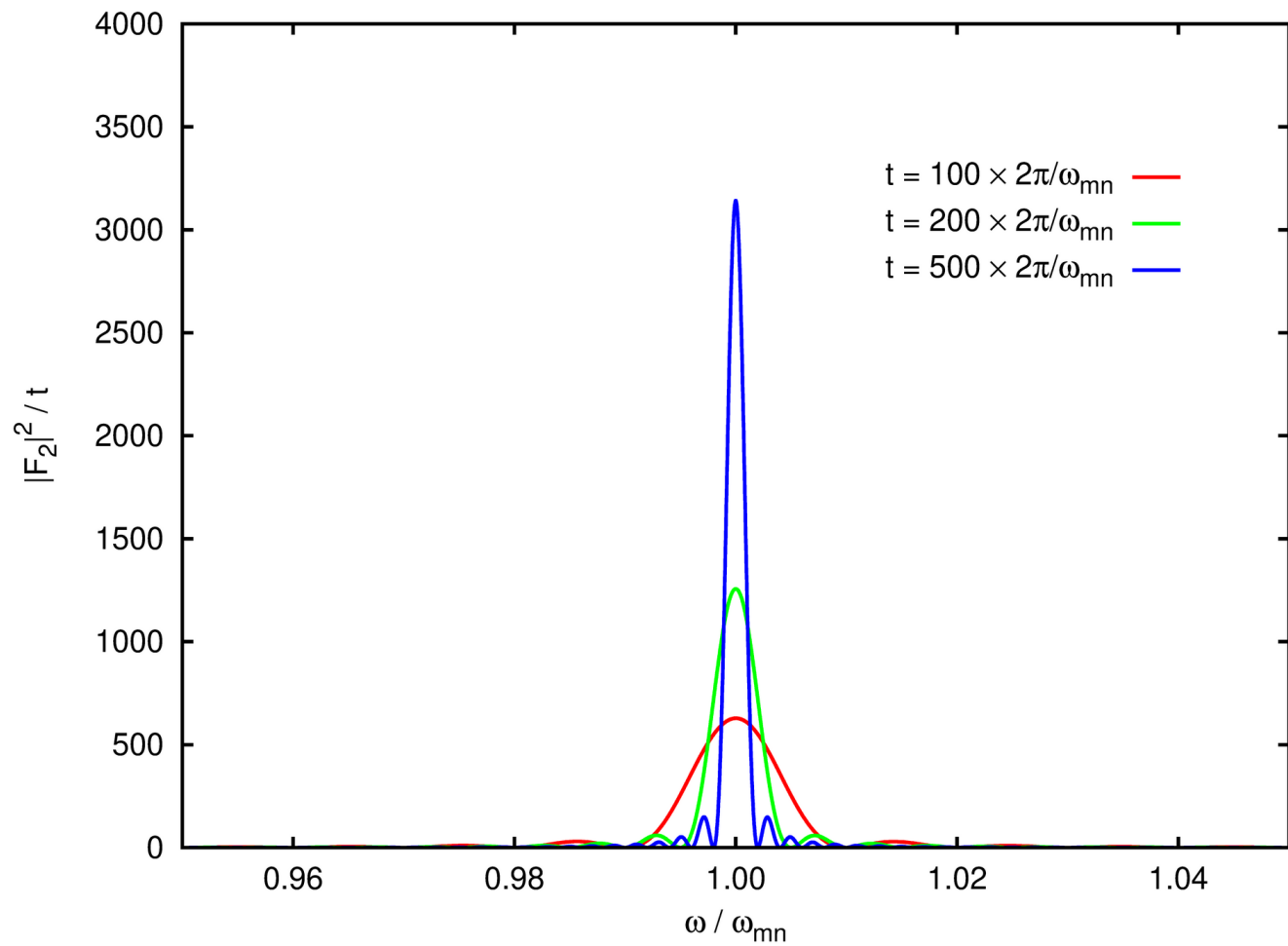
$$P_{n \rightarrow m}(t) = |c_m(t)|^2$$











*The Quantum Theory of the Emission and Absorption of Radiation.*

By P. A. M. DIRAC, St. John's College, Cambridge, and Institute for Theoretical Physics, Copenhagen.

(Communicated by N. Bohr, For. Mem. R.S.—Received February 2, 1927.)

§ 1. *Introduction and Summary.*

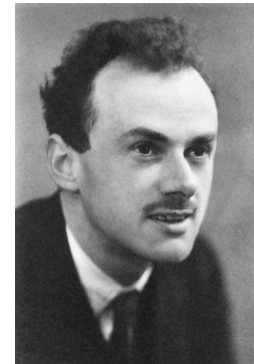
The new quantum theory, based on the assumption that the dynamical variables do not obey the commutative law of multiplication, has by now been developed sufficiently to form a fairly complete theory of dynamics. One can treat mathematically the problem of any dynamical system composed of a number of particles with instantaneous forces acting between them, provided it is describable by a Hamiltonian function, and one can interpret the mathematics physically by a quite definite general method. On the other hand, hardly anything has been done up to the present on quantum electrodynamics. The

The probability per unit time of a transition to a state for which each  $\gamma_k$  lies between  $\gamma_k'$  and  $\gamma_k' + d\gamma_k'$  is thus (apart from the normalising factor)

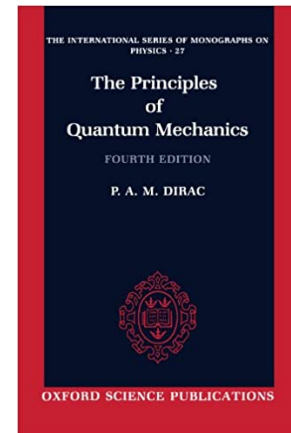
$$2\pi |a^0|^2 / \hbar \cdot |v(W^0, \gamma'; W^0, \gamma^0)|^2 J(W^0, \gamma') d\gamma_1' \cdot d\gamma_2' \dots d\gamma_{u-1}', \quad (24)$$

which is proportional to the square of the matrix element associated with that transition of the perturbing energy.

Proc. Roy. Soc. A 114, 243 (1927)



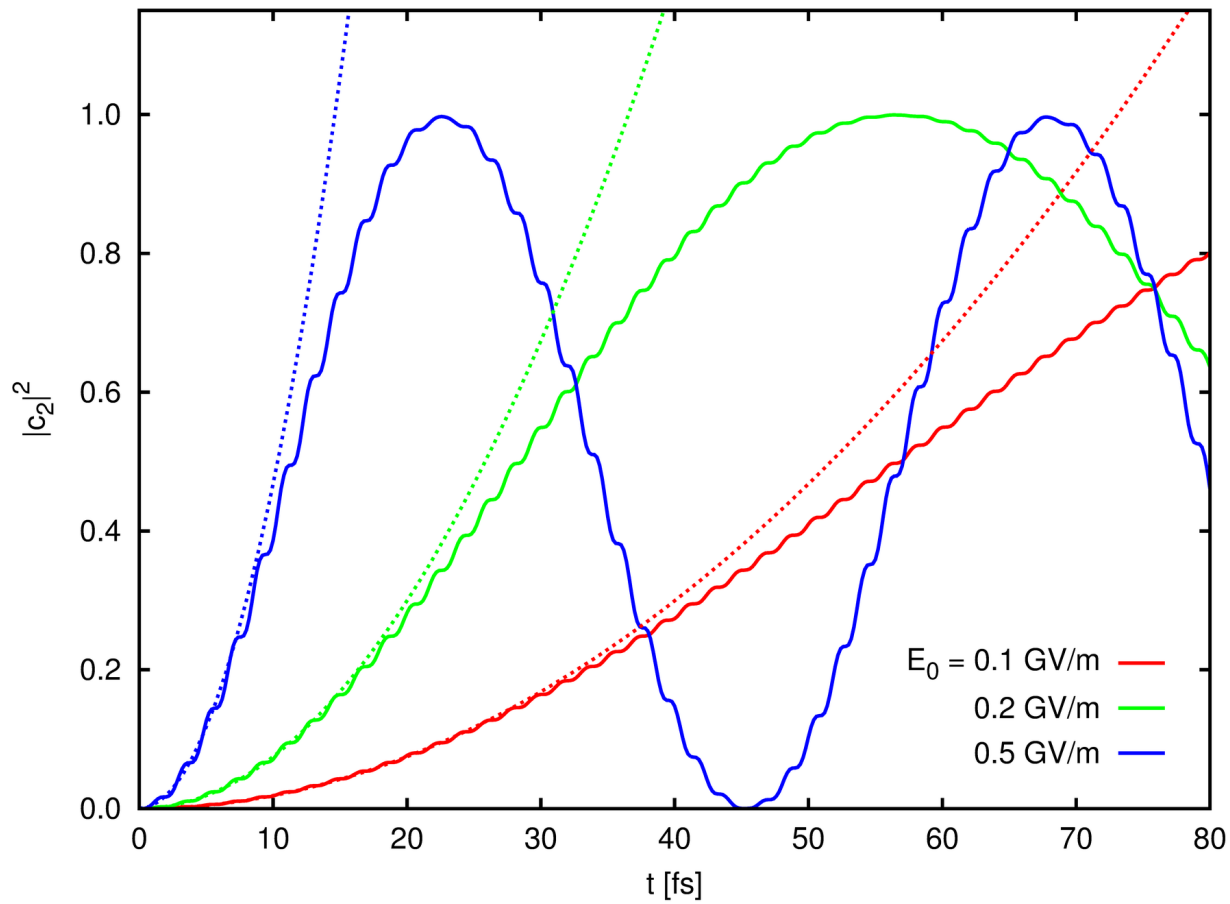
P. A. M. Dirac (1902-1984)  
NC 1933



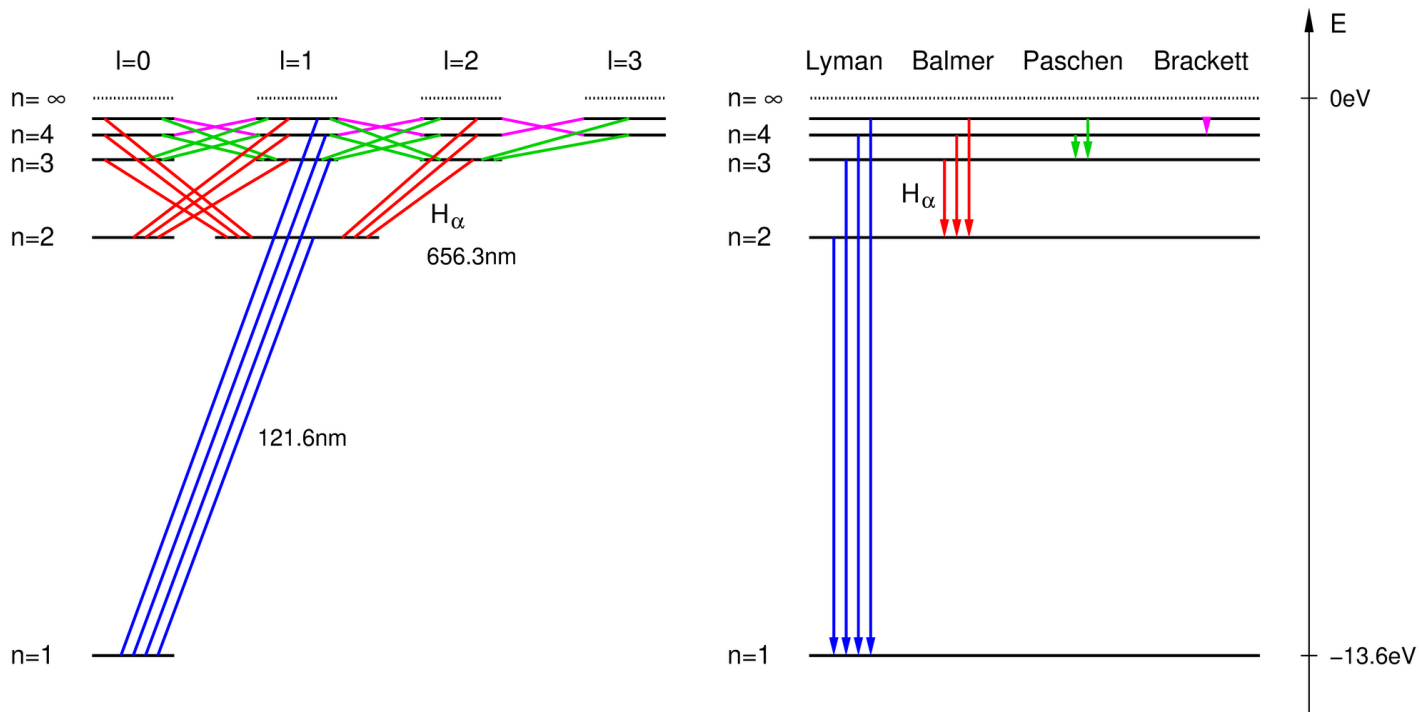
The Principles of Quantum Mechanics



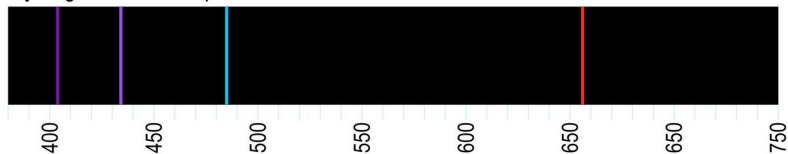
# Rezonanční případ



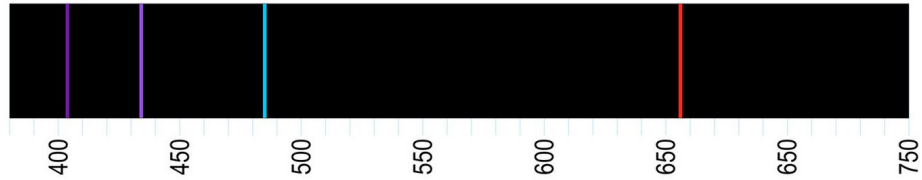
# Schéma dipólových přechodů v atomu vodíku



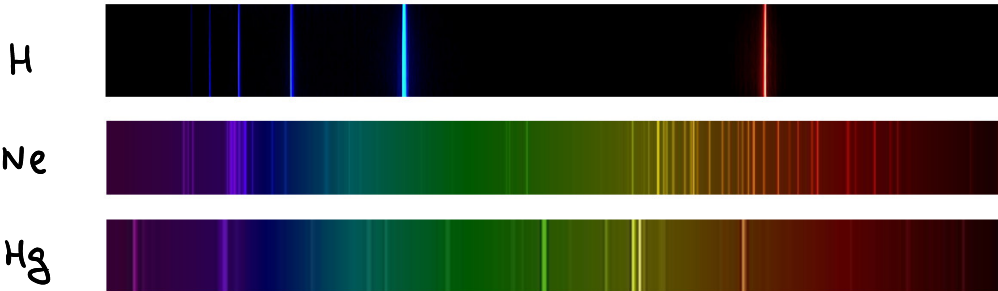
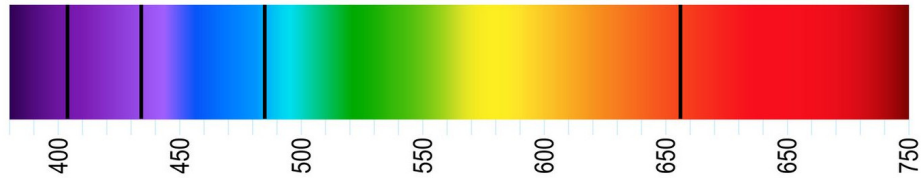
Hydrogen Emission spectrum



Hydrogen Emission spectrum



Hydrogen Absorption spectrum



**Figure 7.3.5** *The Emission Spectra of Elements Compared with Hydrogen. These images show (a) hydrogen gas, which is atomized to hydrogen atoms in the discharge tube; (b) neon; and (c) mercury. The strongest lines in the hydrogen spectrum are in the far UV Lyman series starting at 124 nm and below. The strongest lines in the mercury spectrum are at 181 and 254 nm, also in the UV.*

# STRUKTUR DER MATERIE IN EINZELDARSTELLUNGEN

HERAUSGEGEBEN VON  
M. BORN-GÖTTINGEN UND J. FRANCK-GÖTTINGEN

VII

## GRAPHISCHE DARSTELLUNG DER SPEKTREN VON ATOMEN UND IONEN MIT EIN, ZWEI UND DREI VALENZELEKTRONEN

VON

**DR. W. GROTRIAN**

A. O. PROFESSOR DER UNIVERSITÄT BERLIN  
OBSERVATOR AM ASTROPHYS. OBSERVATORIUM  
IN POTSDAM

ZWEITER TEIL

MIT 163 ABBILDUNGEN



BERLIN  
VERLAG VON JULIUS SPRINGER

1928

4

Wasserstoff.

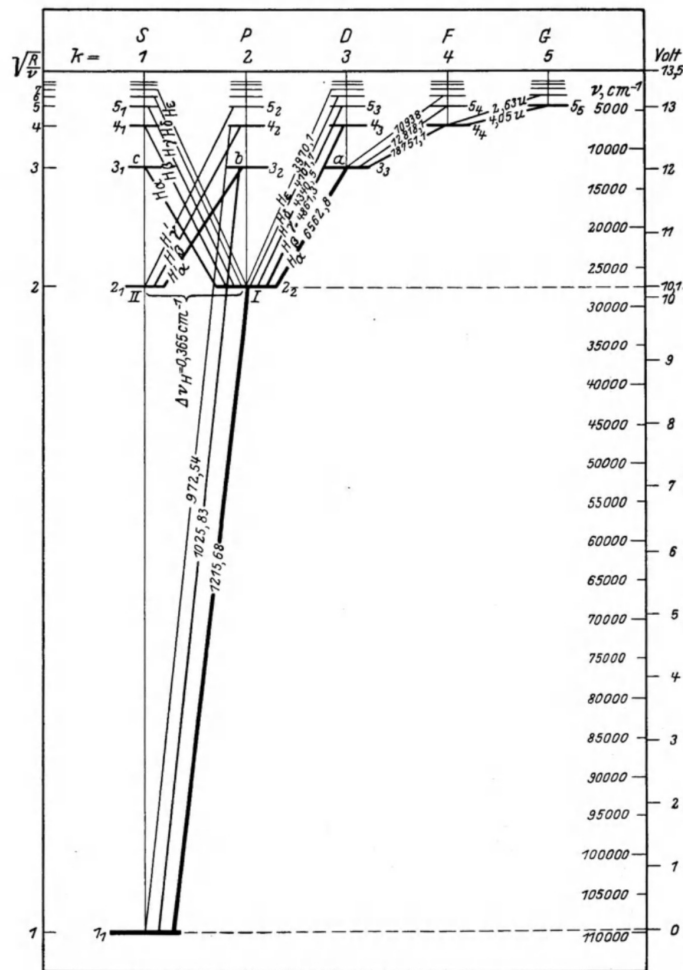
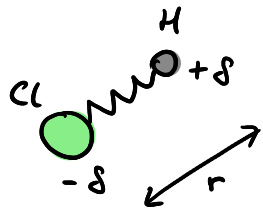


Fig. 3, II, Text S. 15. Niveauschema des Wasserstoffatoms gemäß der \$n\_k\$-Klassifikation der Quantenzustände.



# Schéma energiových hladin v molekule HCl



$$\mu = \frac{m_H m_{Cl}}{m_H + m_{Cl}}$$

Morseho potenciál

$$V(r) = D(e^{-2\alpha\zeta} - 2e^{-\alpha\zeta}) \quad \zeta = \frac{r-r_0}{r_0}$$

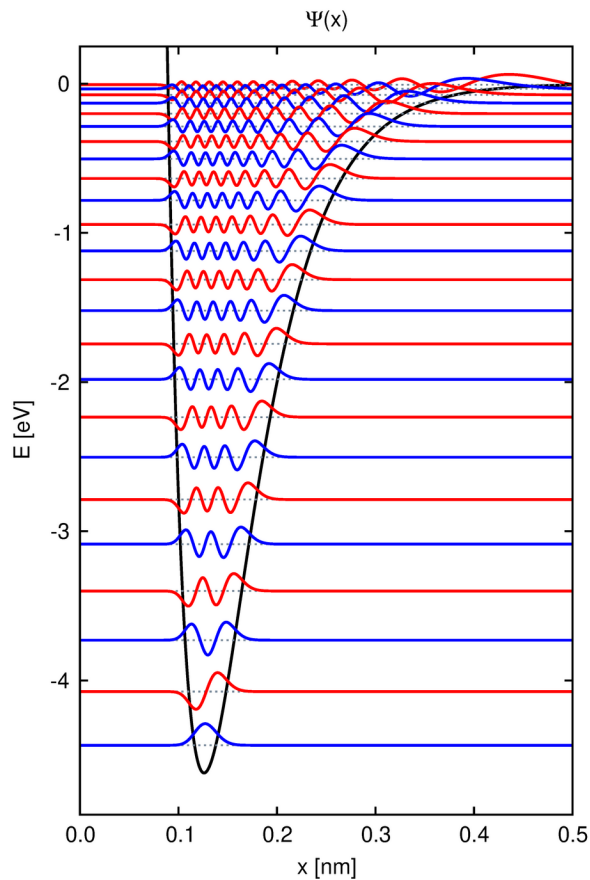
$$r_0 = 0.126 \text{ nm} \quad D = 4.62 \text{ eV} \quad \alpha = 2.38$$

radiaľni Schrödingerova rovnice

$$-\frac{\hbar^2}{2\mu} \frac{1}{r} \frac{d^2}{dr^2} (rR) + \left[ V(r) + \frac{\hbar^2 l(l+1)}{2\mu r^2} \right] R = ER$$

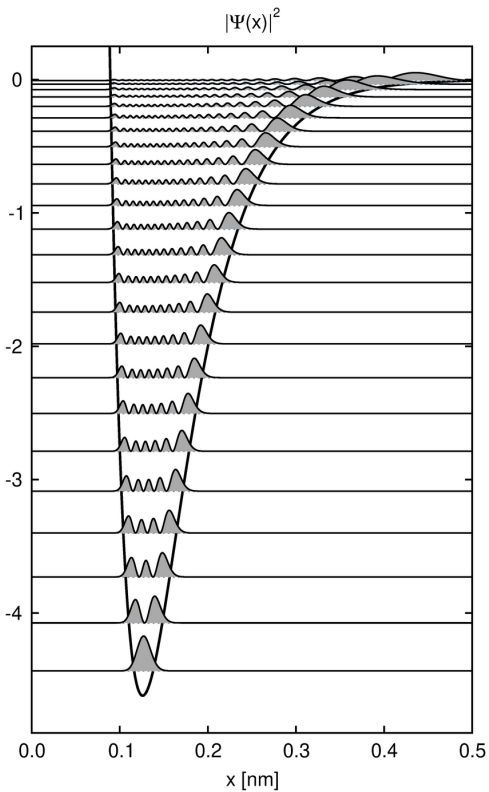
$$\rightarrow E_{nl} \quad \& \quad \Psi_{nlm} = R_{nl}(r) Y_{lm}(\vartheta, \varphi)$$

$l=0$

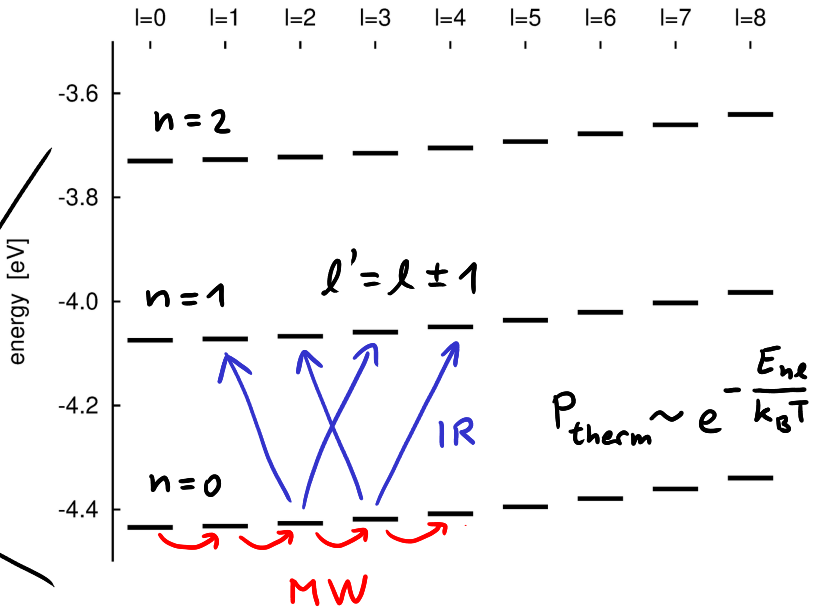
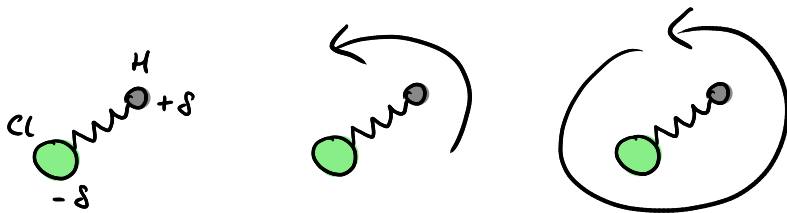


# Schéma energetických hladin v molekule HCl

$l=0$



$n=2$   
 $n=1$   
 $n=0$



# Rotačně-vibrační spektrum HCl

