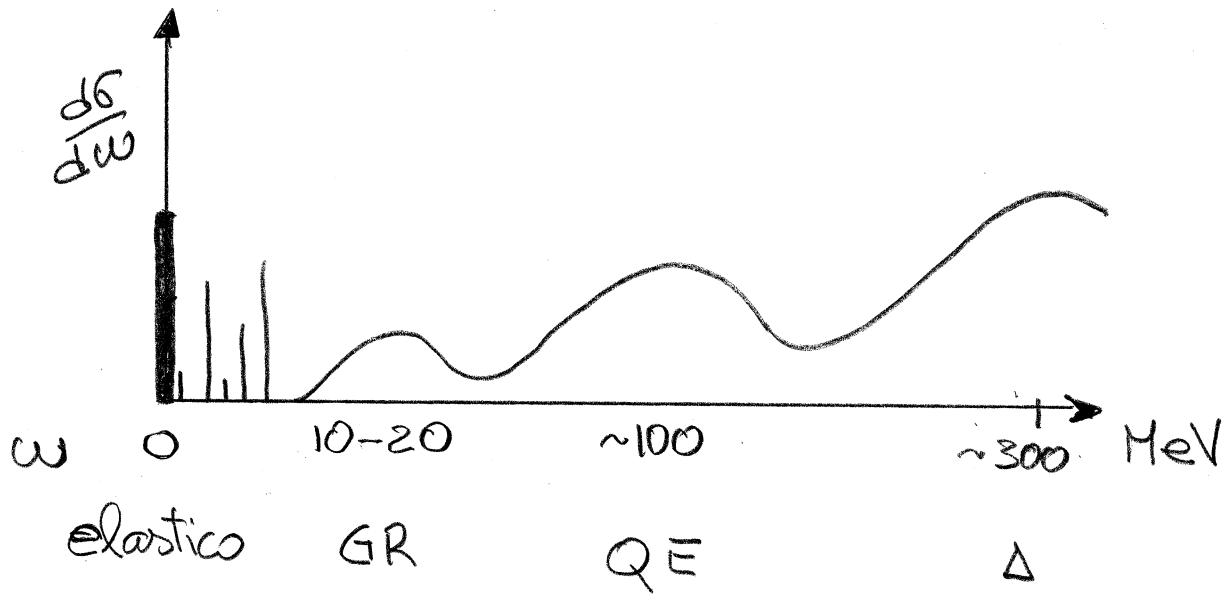
Lezione 10

Emissione γ



Schema di eccitazione del nucleo

γ radiazione elettromagnetica di alta energia ($>$ 100 keV) prodotta da de-eccitazione del nucleo.

Eq. di Maxwell lontano dalle sorgenti

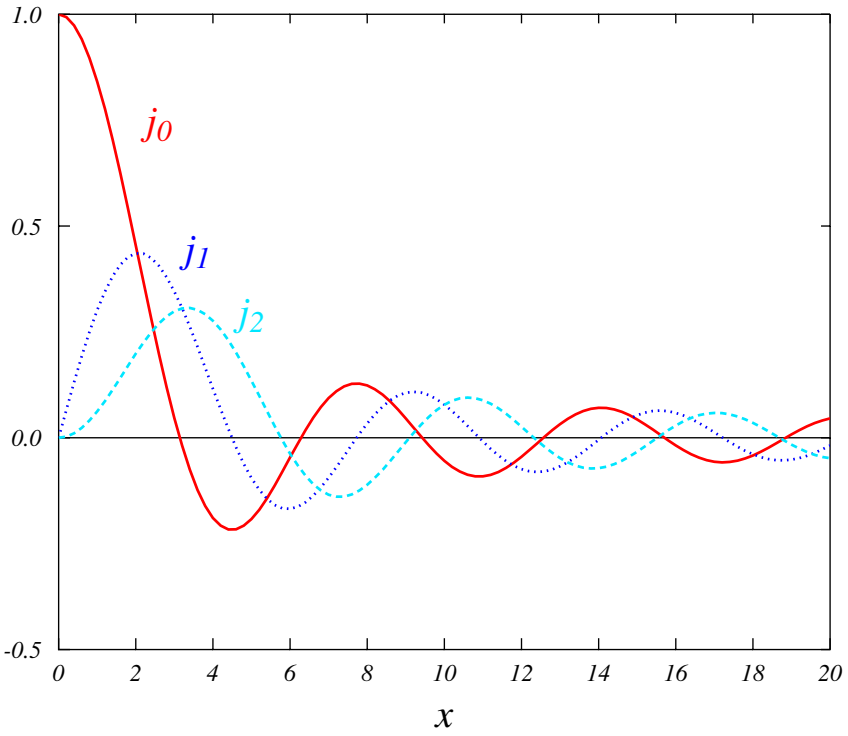
$$\Box\phi(\mathbf{r},t) = \left[\nabla^2 - \frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right]\phi(\mathbf{r},t) = 0$$

$$\phi(\mathbf{r},t) = e^{i(\mathbf{k}\cdot\mathbf{r}-\omega t)} \quad ; \quad \frac{\omega}{c} = |\mathbf{k}|$$

$$e^{i\mathbf{k}\cdot\mathbf{r}} = 4\pi \sum_{l=0}^{\infty} \sum_{m=-l}^{m=l} i^l j_l(kr) Y^*_{l,m}(\Omega_k) Y_{l,m}(\Omega_r)$$

j_l funzione di Bessel sferica, $Y_{l,m}$ armonica sferica, $\Omega \equiv (\theta, \phi)$ coordinate polari sferiche.

Bessel function



$$j_0(x) = \frac{\sin x}{x} \quad ; \quad j_1(x) = \frac{\sin x}{x^2} - \frac{\cos x}{x} \quad , \quad (2l+1) j_l(x) = x \left[j_{l+1}(x) + j_{l-1}(x) \right]$$

Momenti angolari $|J_i - J_f| \leq [l \otimes S]_J \leq J_i + J_f$
$J = l \; ; l \pm 1$

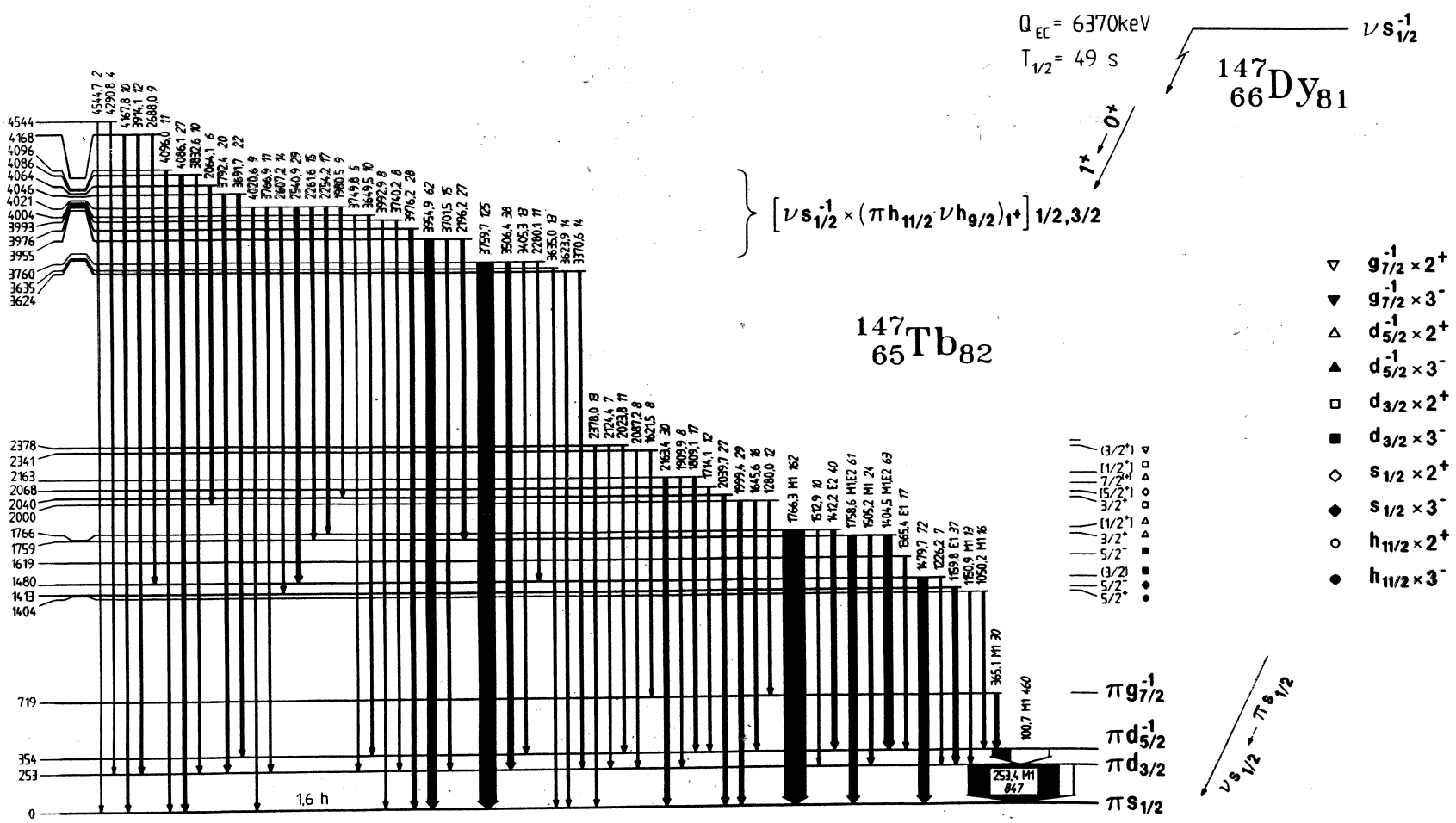
Parità $\Pi_\gamma = \Pi_i \Pi_f$

J	EI ; $\Pi = (-1)^J$	MI ; $\Pi = (-1)^{J+1}$	
0	0^+	0^-	*
1	1^-	1^+	
2	2^+	2^-	
3	3^-	3^+	
4	4^+	4^-	
5	5^-	5^+	

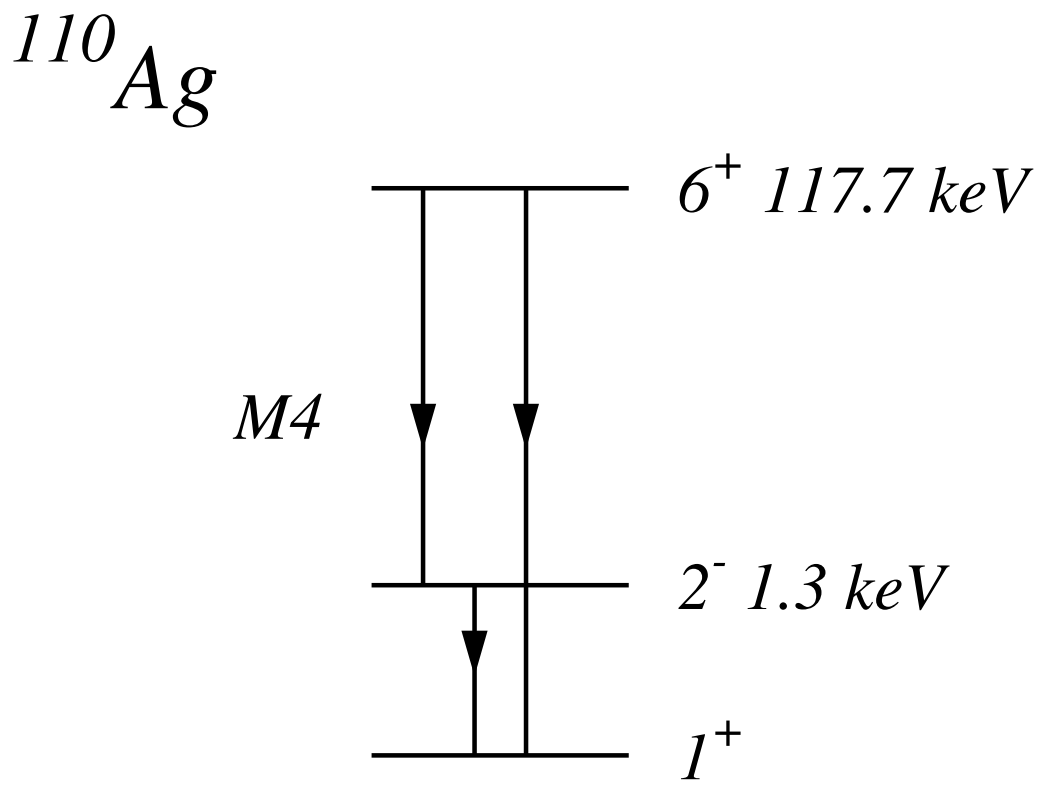
Probabilità di transizione
$| < M_J > |^2 \leq | < E_J > |^2 \quad ; \quad | < E_{J+1} > |^2 \leq | < E_J > |^2$
$| < M_{J+1} > |^2 \leq | < M_J > |^2$

0^+ non eccitato da fotoni reali

0^- non eccitato da eccitazioni e.m.


Q_{EC} = 6370keV
$T_{1/2}$ = 49 s
$\nu s^{-1}_{1/2}$
$^{147}_{66}Dy_{81}$
1+ → 0+
$\left[\nu s^{-1}_{1/2} \times (\pi h_{11/2}\, \nu h_{9/2})_{1^+}\right]$ 1/2,3/2
$^{147}_{65}Tb_{82}$
$g^{-1}_{7/2} \times 2^+$
$g^{-1}_{7/2} \times 3^-$
$d^{-1}_{5/2} \times 2^+$
$d^{-1}_{5/2} \times 3^-$
$d_{3/2} \times 2^+$
$d_{3/2} \times 3^-$
$s_{1/2} \times 2^+$
$s_{1/2} \times 3^-$
$h_{11/2} \times 2^+$
$h_{11/2} \times 3^-$
$\pi g^{-1}_{7/2}$
$\pi d^{-1}_{5/2}$
$\pi d_{3/2}$
$\pi s_{1/2}$
$\nu s_{1/2} \leftarrow \pi s_{1/2}$
1.6 h
253.4 M1
847

Isomero $^{110}Ag^{m}$



Domande

[N2-24] [N3-4] [N3-19] [N4-8]