Rafeindir - ljóseindir

Vigur svið → $\bar{E}, \bar{B}$

ytra mætti rafeinda

$$H = \int d\bar{r}\, \phi^{+} \left\{ \frac{1}{2m}\left(\bar{p} + \frac{e}{c}\bar{A}\right)^2 + V(r) \right\} \phi + H_{EM}$$

$$= \int d\bar{r}\, \phi^{+} \left\{ \frac{p^2}{2m} + V(r) \right\} \phi + H_{EM}$$

$$- \frac{1}{c}\int d\bar{r}\, \bar{j}\cdot\bar{A} - \frac{e}{2mc^2}\int d\bar{r}\, \rho A^2$$

straumþéttleiki rafeinda

hleðsluþéttleiki rafeinda

Safstæð QED

nákvæmt

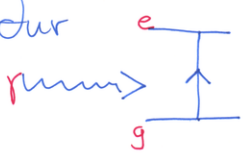
Allnokkrar aðgerðir

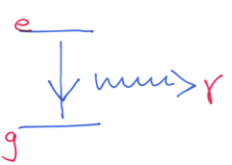
{ bylgjulengd ljóss >> rafeindakerfi
tvö ástönd rafeindakerfis .... }

Jaynes-Cummings líkan

$$\hat{H} = \frac{\hbar\omega}{2}\sigma_z + \hbar\nu\, a^+a + \frac{\hbar\Omega}{2}\left\{a\sigma_+ + a\sigma_- + a^+\sigma_+ + a^+\sigma_-\right\}$$

hermuliður





Oft er notuð einföld truflunar hugsun

Hvernig eru liturnar fyrir því að veikt ljóseindasvið valdi ísogi eða geislun, sjálfgeislun

Bara stöðudir hermulidir

En hvað ef „atómið" eru í ljóseindahóli þ.a. t.d. geti orðið mjög sterkt

Hvernig breytist orkuróf kerfisins, hvað gera andhermulidirnir? Ekki lengur truflanafræði

Reiknum nákvæmlega í endanlegum grunni

Grundzustand (g,N) (e,N) . . . . . .

Vektor virkja

$$T_+ (g,N) = (e,N)$$

$$T_+ (e,N) = 0$$

$$T_- (e,N) = (g,N)$$

$$T_- (g,N) = 0$$

$$a (e,N) = \sqrt{N}\,(e,N-1)$$

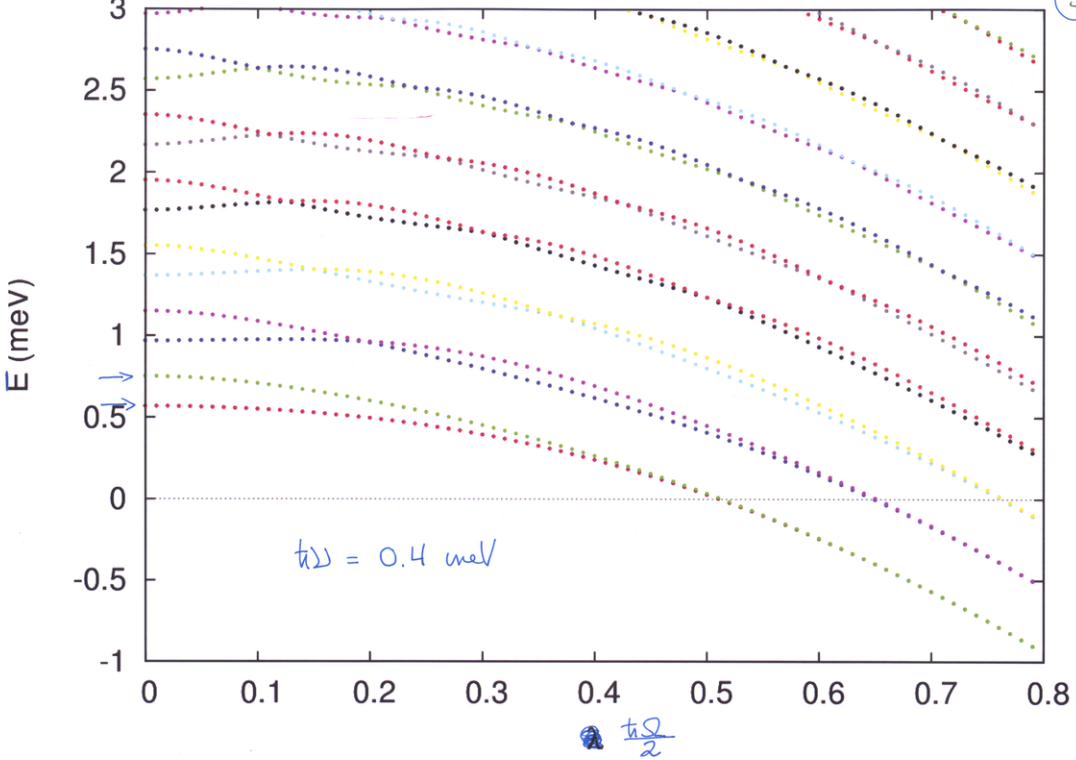
$$a (e,0) = 0$$

$$a (g,0) = 0$$

$$a (g,N) = \sqrt{N}\,(g,N-1)$$

$$a^+ (g,N) = \sqrt{N+1}\,(g,N+1)$$

$$a^+ (e,N) = \sqrt{N+1}\,(e,N+1)$$


E (meV)
3
2.5
2
1.5
1
0.5
0
-0.5
-1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
ħΔ = 0.4 meV
ħΩ/2