1. Equations:

Maxwell-bloch equation, after aproximations, with external phase modulation for E_y

$$\begin{cases} \partial_\tau E_x = -kE_x + \mu P_x \\ \partial_\tau E_y = -kE_y + \mu P_y + i.(\Delta\phi_0 + m.cos(w_{mod}.\tau)).E_x \\ \partial_\tau P_{x,y} = -(1 + i\delta)P_{x,y} + E_{x,y}.D \\ \partial_\tau D = -\gamma_{||}(D - D_0 + \frac{1}{2}(E^*_{x,y}P_{x,y} + E_{x,y}P^*_{x,y})) \end{cases}$$

with $E_{x,y}$ and $P_{x,y} \in \mathbb{C}$

Normalizations made: $\tau = \gamma_\perp.t$, $k = \frac{\bar{k}}{\gamma_\perp}$, $\gamma_{||} = \frac{\bar{\gamma_{||}}}{\gamma_\perp}$, $\eta = \frac{z}{L}$, $\delta'_{ac} = \frac{w_a - w_0}{\gamma_\perp}$

Aproximations:

1-$k, \gamma_{||} << \gamma_\perp$ – Homogenously broadened laser linewidth $\nabla^2 E - \frac{1}{c^2}\partial_t^2 E = \alpha\partial_t^2 E$

2-Plane wave: $\nabla^2_\perp = 0$

3-Two level medium

4-Slowly varying amplitud

5-Unidirectional field

6-Rotating wave approx $\partial_{t^2} << \partial_t$

7-Single longitudinal mode

8-$g' - > 0$, $R_0 - > 1$ – Uniform field limit

9-m,$w_{mod} << 1$, $w_{mod} << \gamma_\perp$ ..chequear..