$$m\gamma\,\ddot{z} = -eE_z = e\frac{dV}{dz}$$

$$\frac{m\gamma}{e}\frac{d\dot{z}}{dt}dt = \frac{dV}{dz}dz$$

$$\frac{m\gamma}{e}\frac{\dot{z}^2}{2} = V + \underbrace{C}_{\frac{m\gamma}{e}\frac{v_{\perp\infty}^2}{2}}$$

$$\frac{dz}{dt} = \sqrt{\frac{2e}{m\gamma}V + v_{\perp\infty}^2} \qquad (V<0)$$

$\rightarrow z_{min}$

$$\frac{dz}{\sqrt{v_{\perp\infty}^2 + \frac{2e}{m\gamma}V(z)}} = dt$$

$\frac{d\Gamma(\omega)}{dt}$

$v\,dt = dx$

$$P(\omega) = \int (v\,dt)\,\frac{d\Gamma(\omega)}{dx} = 2\int_{z_{min}}^{\infty} \frac{v\,dz}{\sqrt{v_{\perp\infty}^2 + \frac{2e}{m\gamma}V(z)}}$$

$v_{\perp\infty} = v\,\mathrm{tg}\,\varphi \;(\cong v\,\varphi)$

$E_0 = 100\,\mathrm{keV}$
$200\,\mathrm{keV}$

$V_0, \varphi \rightarrow z_{min}$