

Exercise: Dirichlet BCs: Paul Trap. (E.39)

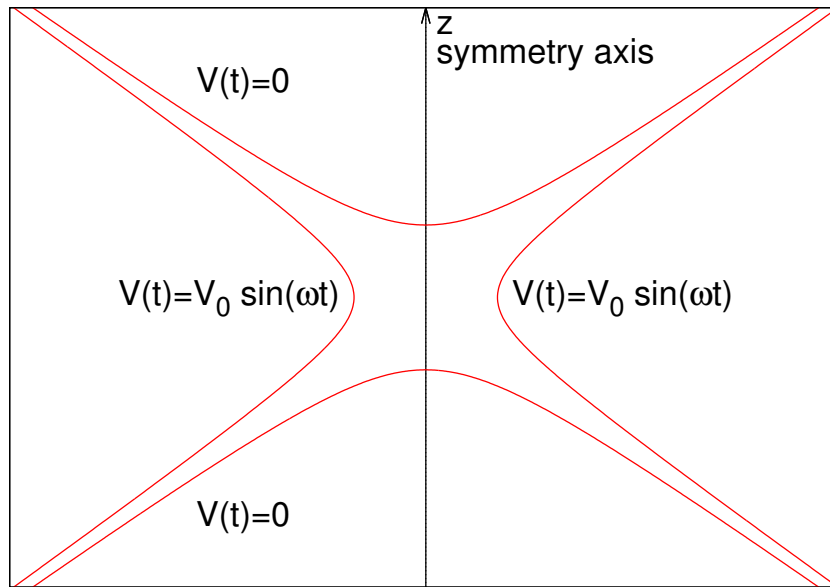


Fig. E.4 Cross section of Paul trap.

A Paul Trap (Physics Nobel Prize 1989) is used to confine charged particles. Let us consider a cylindrical symmetric trap, which is conveniently described in cylindrical coordinates (ρ, θ, z) . The trap electrodes are hyperbolas of revolution about the z axis. The figure depicts a cross section of the trap.

By rotation about the z axis the two grounded hyperbolas with potential $V(t) = 0$ form the upper and lower end electrodes, defined by the equation $z^2 = \rho^2/2 + d^2$.

The hyperbolas with potential $V(t) = V_0 \sin(\omega t)$ are connected and form the ring electrode, defined by the equation $\rho^2/2 = z^2 + d^2/2$.