

Electric Dipole Potential



- Use spherical coordinates: $V = V(r, \theta)$ independent of azimuthal coordinate ϕ .
- Superposition principle: $V = V_+ + V_- = k \left(\frac{q}{r_+} + \frac{(-q)}{r_-} \right) = kq \frac{r_- - r_+}{r_- r_+}$
- Large distances ($r \gg L$): $r_- - r_+ \simeq L \cos \theta$, $r_- r_+ \simeq r^2 \Rightarrow V(r, \theta) \simeq k \frac{qL \cos \theta}{r^2}$
- Electric dipole moment: $p = qL$ (magnitude)
- Electric dipole potential: $V(r, \theta) \simeq k \frac{p \cos \theta}{r^2}$

