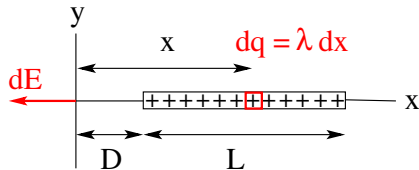


Electric Field of Charged Rod (1)



- Charge per unit length: $\lambda = Q/L$
- Charge on slice dx : $dq = \lambda dx$



- Electric field generated by slice dx : $dE = \frac{k dq}{x^2} = \frac{k \lambda dx}{x^2}$
- Electric field generated by charged rod:

$$E = k\lambda \int_D^{D+L} \frac{dx}{x^2} = k\lambda \left[-\frac{1}{x} \right]_D^{D+L} = k\lambda \left[\frac{1}{D} - \frac{1}{D+L} \right] = \frac{kQ}{D(D+L)}$$

- Limiting case of very short rod ($L \ll D$): $E \simeq \frac{kQ}{D^2}$
- Limiting case of very long rod ($L \gg D$): $E \simeq \frac{k\lambda}{D}$