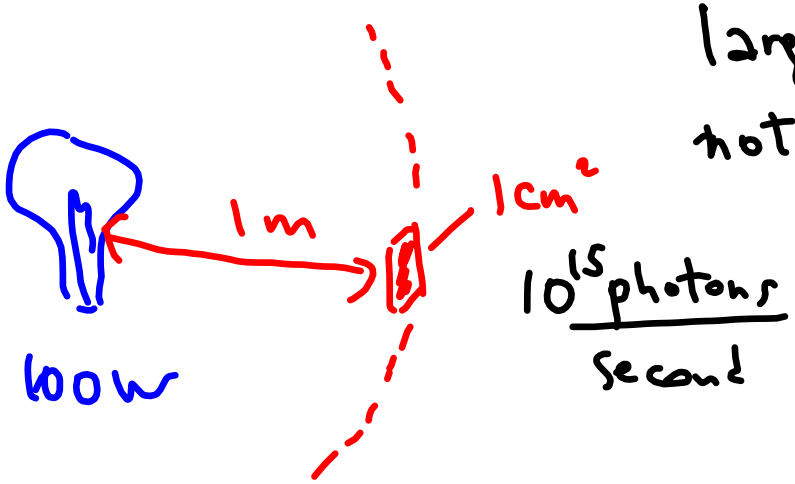
Introduction

1.



large # of photons
not too large energies

10^{15} photons / second

2. $m_\gamma = 0$, $m_\gamma < 4 \times 10^{-51}\ kg$

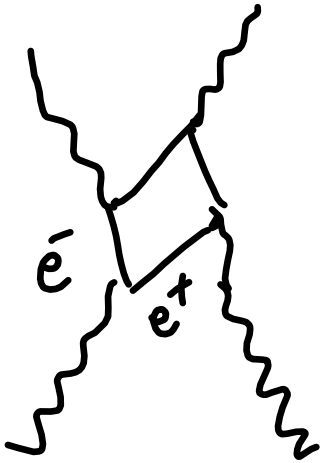
$m_e \sim 9.1 \times 10^{-31}\ kg$

$m_\gamma < 2 \times 10^{-58}\ kg$

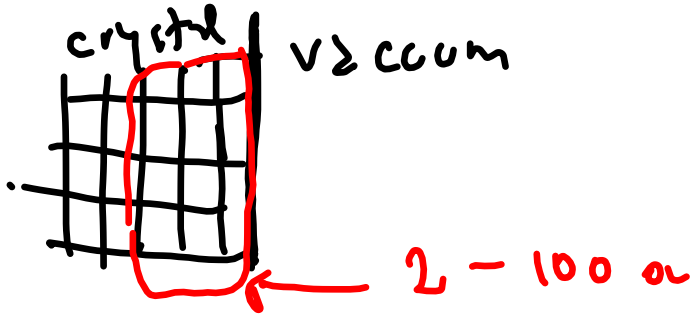
2012

$\phi \sim \frac{1}{r} e^{-\mu r}$

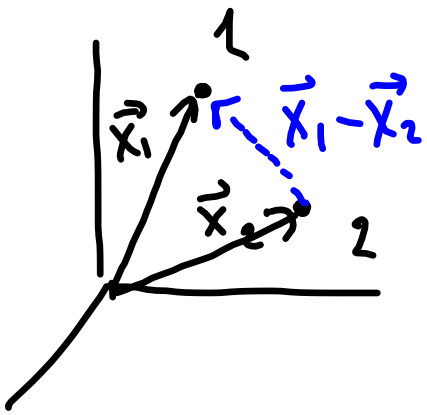
3. Linear equations



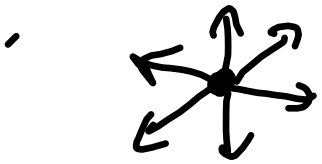
4. Surface charge density σ

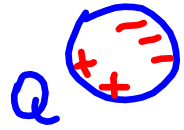


Chapter 1 Electrostatics

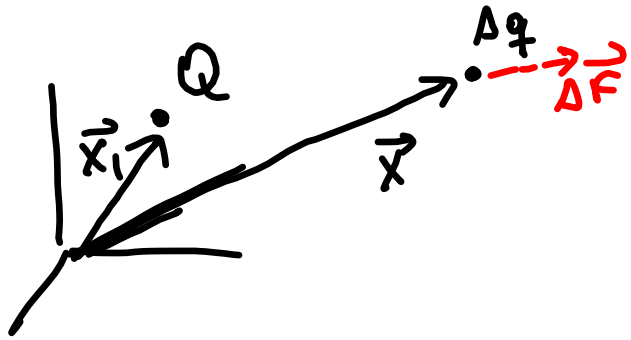


$$\vec{F}_{\text{on 1 caused by 2}} = \frac{1}{4\pi\epsilon_0} q_1 q_2 \frac{(\vec{x}_1-\vec{x}_2)}{|\vec{x}_1-\vec{x}_2|^3}$$



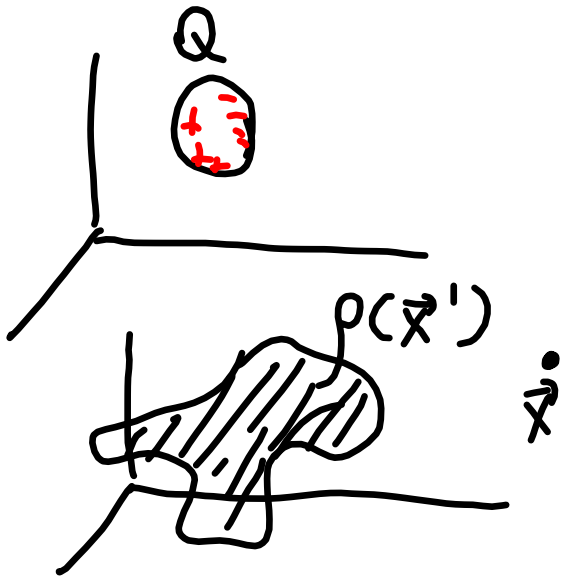


Electric Fields



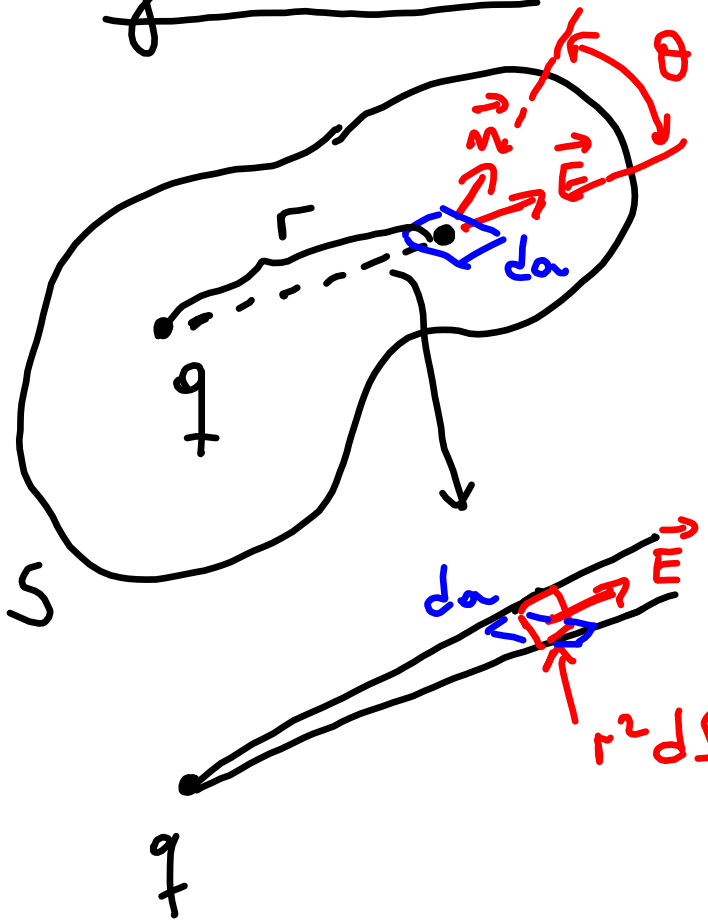
$$\vec{E}_{\text{at } \Delta q} = \lim_{\Delta q \to 0} \frac{\vec{\Delta F}}{\Delta q}$$

$$\vec{E}(\vec{x}) = \frac{1}{4\pi\epsilon_0} Q \frac{(\vec{x}-\vec{x}_1)}{|\vec{x}-\vec{x}_1|^3}$$



$$\vec{E}(\vec{x}) = \frac{1}{4\pi\epsilon_0} \int d^3x' \, \rho(\vec{x}') \frac{(\vec{x}-\vec{x}')}{|\vec{x}-\vec{x}'|^3}$$

Gauss's law



$$(\vec{E}\cdot\vec{n})\,da = \frac{1}{4\pi\epsilon_0}\cdot\frac{q}{r^2}\cdot 1\cdot \underbrace{\cos\theta\, da}_{r^2 d\Omega}$$

$$\oint_S (\vec{E}\cdot\vec{n})\,da = \frac{q}{\epsilon_0} \quad \text{if } q \text{ inside}$$

$$\oint_S = 0 \quad \text{if } q \text{ outside}$$