

Lecture 6 (1/31/05)

Relativistic Electrodynamics (continued)

14. Conservation

15. Action principle for EM field (Jackson 12.7, pg. 598)

$$S = \int d^4x \left[\frac{-1}{4} F_{\mu\nu} F^{\mu\nu} - A_\mu J^\mu \right]$$

16. Gauge invariance preservation

$$\partial_\nu J^\nu = 0.$$

17. Proca Equation and explicit breaking of gauge invariance (Jackson 12.8, pg. 600)

18. Green's function solution to Maxwell Equations (Jackson 12.11, pg 612)

$$\square_x G(x, y) = \delta^{(4)}(x - y)$$

$$\oint dz f(z) = 2\pi i \sum_j \text{Res}(f(\beta_j))$$

$$\text{Res}f(\beta_i) = \frac{1}{(m-1)!} \frac{d}{dz^{m-1}} \{(z - \beta_i)^m f(z)\} \Big|_{z=\beta_i}$$