ERRATUM

Pramana - J. Phys., Vol. 51, Nos. 3 & 4, September/October 1998, pp. 317–355

Charges in Gauge Theories

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- On p. 327 just before Eq. 39 it should read $\beta = -1$.
- On p.328 it should read:
  The free field equation $\Box A_\mu^{\text{free}} = 0$ implies that

$$A_\mu^{\text{free}}(x) = \int d^3z \left(\partial_0^z D(x-z) A_\mu^{\text{free}}(z) - D(x-z)\partial_0 A_\mu^{\text{free}}(z)\right) \tag{48}$$

where $D(x-z)$ is the commutator function for free fields:

$$D(x-y) = -\int \frac{d^3\mathbf{k}}{(2\pi)^3}\frac{1}{\omega_k} e^{i\mathbf{k}\cdot(\mathbf{x}-\mathbf{y})} \sin\left(\omega_k(x^0-y^0)\right). \tag{49}$$

The identification in (48) is made by first observing that the right hand side is independent of z^0: setting $z^0 = x^0$ then implies the result. Exploiting this z^0-independence, the commutator $[A_\mu^{\text{free}}(x), A_\nu^{\text{free}}(y)]$ is simply calculated by using (48) with $z^0 = y^0$. Then the equal time commutation relations $[A_\mu(y), \dot{A}_\nu(z)]_{\text{et}} = -ig_{\mu\nu}\delta(y-z)$ can be used. This, in conjunction with our observation that the free and asymptotic interacting fields have the same commutators, results in the space time commutators in Feynman gauge being:

$$[A_\mu(x), A_\nu(y)] = [A_\mu^{\text{free}}(x), A_\nu^{\text{free}}(y)] = -ig_{\mu\nu}D(x-y). \tag{50}$$

- On p. 340, Eq. 93 should read:

$$F_R = \frac{e^2}{(2\pi)^3}\int d^4k e^{ik\cdot x}\theta(k_0)\delta(k^2)\frac{r_\mu r_\nu}{(r\cdot k)^2}\Pi_R^{\mu\nu}, \tag{93}$$

(corrections in references)

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