

場の量子論 p246check9.5

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$$S[\Phi, A_\mu] = \int d^4x \{ (D_\mu \Phi)^* D^\mu \Phi - m^2 \Phi^* \Phi \} \quad (1)$$

$$\delta S[\Phi, A_\mu] = \int d^4x \{ (D_\mu \delta \Phi)^* D^\mu \Phi - m^2 \delta \Phi^* \Phi + (D_\mu \Phi)^* D^\mu \delta \Phi - m^2 \Phi^* \delta \Phi \} \quad (2)$$

$$\begin{aligned} &= \int d^4x \{ D_\mu [(\delta \Phi)^* D^\mu \Phi] - (\delta \Phi)^* D_\mu D^\mu \Phi - m^2 \delta \Phi^* \Phi \\ &\quad + D^\mu [(D_\mu \Phi)^* \delta \Phi] - D^\mu (D_\mu \Phi)^* \delta \Phi - m^2 \Phi^* \delta \Phi \} \end{aligned} \quad (3)$$

$$\begin{aligned} &= \int d^4x \{ D_\mu [(\delta \Phi)^* D^\mu \Phi] - [D_\mu D^\mu \Phi + m^2 \Phi] (\delta \Phi)^* \\ &\quad + D^\mu [(D_\mu \Phi)^* \delta \Phi] - [D^\mu (D_\mu \Phi)^* + m^2 \Phi^*] \delta \Phi \} \end{aligned} \quad (4)$$

$$\delta S = 0$$

$$D_\mu D^\mu \Phi + m^2 \Phi = 0 \quad (5)$$

$$D^\mu D_\mu \Phi^* + m^2 \Phi^* = 0 \quad (6)$$

参考文献

- [1] 坂本眞人著「場の量子論-不変性と自由場を中心にして」(裳華房,2014,ISBN9784785325114)