# 場の量子論 p174check6.11

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2023 年 12 月 25 日

## 1 方程式

$$[i\gamma^\mu(\partial_\mu + iqA_\mu) - mI_4]e^{i\beta\gamma^5}\psi = 0 \tag{1}$$
$$[e^{-i\beta\gamma^5}i\gamma^\mu(\partial_\mu + iqA_\mu) - e^{i\beta\gamma^5}mI_4]\psi = 0 \tag{2}$$

## 2 流れ

$$\begin{aligned}
\partial_\mu j^{\mu 5} &= \partial_\mu(\bar{\psi}\gamma^\mu\gamma^5\psi) && (3)\\
&= \partial_\mu(\psi^\dagger\gamma^0\gamma^\mu\gamma^5\psi) && (4)\\
&= (\partial_\mu\psi^\dagger)\gamma^0\gamma^\mu\gamma^5\psi + \psi^\dagger\gamma^0\gamma^\mu\gamma^5(\partial_\mu\psi) && (5)\\
&= (\partial_\mu\psi^\dagger)(\gamma^\mu)^\dagger\gamma^0\gamma^5\psi - \psi^\dagger\gamma^0\gamma^5\gamma^\mu(\partial_\mu\psi) && (6)\\
&= [i\psi^\dagger(q(\gamma^\mu)^\dagger A_\mu + m)]\gamma^0\gamma^5\psi - \psi^\dagger\gamma^0\gamma^5[-i(q\gamma^\mu A_\mu + m)\psi] && (7)\\
&= iqA_\mu\psi^\dagger\gamma^0\gamma^\mu\gamma^5\psi + im\psi^\dagger\gamma^0\gamma^5\psi - iqA_\mu\psi^\dagger\gamma^0\gamma^\mu\gamma^5\psi + im\psi^\dagger\gamma^0\gamma^5\psi && (8)\\
&= 2im\psi^\dagger\gamma^0\gamma^5\psi && (9)\\
&= 2im\bar{\psi}\gamma^5\psi && (10)
\end{aligned}$$

## 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)