

# Quantenfeldtheorie in der T0-Theorie

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# Kapitel 1

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## **Zusammenfassung**

Die Quantenfeldtheorie (QFT) bildet das mathematische Fundament des Standardmodells. Dieses Dokument zeigt, wie die T0-Theorie die QFT erweitert und das intrinsische Zeitfeld als zusätzliches fundamentales Feld einführt.

# 1.1 Grundlagen der QFT

## 1.1.1 Quantisierung von Feldern

In der kanonischen Quantisierung werden Felder zu Operatoren:

$$[\hat{\phi}(x), \hat{\pi}(y)] = i\hbar\delta^3(x - y) \quad (1.1)$$

## 1.1.2 Propagatoren

Der Feynman-Propagator beschreibt die Ausbreitung von Teilchen:

$$D_F(x - y) = \langle 0 | T\{\hat{\phi}(x)\hat{\phi}(y)\} | 0 \rangle \quad (1.2)$$

# 1.2 T0-Erweiterung der QFT

## 1.2.1 Das Zeitfeld als Quantenfeld

In der T0-QFT wird das intrinsische Zeitfeld quantisiert:

$$[\hat{T}(x), \hat{E}(y)] = i\delta^3(x - y) \quad (1.3)$$

Diese Vertauschungsrelation spiegelt die Zeit-Masse-Dualität wider.

## 1.2.2 T0-Propagator

Der T0-Propagator für das Zeitfeld ist:

$$G_T(x - y) = \langle 0 | T\{\hat{T}(x)\hat{T}(y)\} | 0 \rangle = \frac{1}{k^2 + m_T^2} \quad (1.4)$$

# 1.3 Wechselwirkungen

## 1.3.1 Kopplung an Materie

Die Kopplung des Zeitfeldes an Fermionen:

$$\mathcal{L}_{\text{int}} = \lambda \bar{\psi} \hat{T} \psi \quad (1.5)$$

erzeugt Beiträge zu den anomalen magnetischen Momenten.

## 1.3.2 Feynman-Diagramme

### T0-Feynman-Regeln

Zusätzlich zu den Standard-QFT-Regeln:

- Zeitfeld-Propagator:  $\frac{i}{k^2 - m_T^2 + i\epsilon}$
- Vertex:  $-i\lambda$
- Masseneinsetzung:  $m_\ell$  (Leptonmasse)

## 1.4 Renormierung

Die T<sub>0</sub>-Erweiterung ist renormierbar:

$$\mathcal{L}_{\text{counter}} = \delta Z_T (\partial T)^2 + \delta m_T^2 T^2 + \delta \lambda T \bar{\psi} \psi \quad (1.6)$$

Dies sichert die Konsistenz auf allen Energieskalen.

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