

Neutrinos in der T0-Theorie

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Kapitel 1

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Zusammenfassung

Neutrinos stellen eines der faszinierendsten Rätsel der Teilchenphysik dar. Die T0-Theorie bietet einen parameterfreien Rahmen zur Berechnung von Neutrinomassen und Mischungswinkeln, basierend auf dem fundamentalen Parameter $\xi = \frac{4}{3} \times 10^{-4}$ und geometrischen Prinzipien.

1.1 Das Neutrino-Rätsel

1.1.1 Experimentelle Situation

Die experimentelle Teilchenphysik hat etabliert:

- Neutrinos haben kleine, aber nicht-verschwindende Massen
- Neutrino-Oszillationen zeigen Mischung zwischen Flavorzuständen
- Die Massenhierarchie (normal oder invertiert) ist noch ungeklärt

1.1.2 Standardmodell-Grenzen

Das Standardmodell kann Neutrinomassen nicht erklären. Neutrinos sind im originalen SM masselos – Massen erfordern Erweiterungen wie:

1. See-Saw-Mechanismus
2. Majorana-Massen
3. Zusätzliche Higgs-Felder

1.2 T0-Vorhersagen für Neutrinos

1.2.1 Massenberechnung

Die T0-Theorie berechnet Neutrinomassen aus geometrischen Prinzipien:

T0-Neutrinomassen

$$m_{\nu_i} = \frac{\xi^{n_i}}{K_{\text{frak}}} \cdot m_0 \quad (1.1)$$

wobei:

- n_i die Generationszahl (1, 2, 3) ist
- $K_{\text{frak}} = 0,986$ der fraktale Korrekturfaktor ist
- m_0 eine charakteristische Massenskala ist

1.2.2 Mischungswinkel

Die PMNS-Mischungsmatrix kann aus geometrischen Beziehungen hergeleitet werden:

$$U_{\text{PMNS}} = R_{23}(\theta_{23}) \cdot R_{13}(\theta_{13}) \cdot R_{12}(\theta_{12}) \quad (1.2)$$

Die T0-Vorhersagen für die Mischungswinkel stimmen mit experimentellen Werten überein.

1.3 Experimentelle Tests

1.3.1 Vergleich mit Daten

Parameter	T0-Vorhersage	Experiment
Δm_{21}^2	$7,5 \times 10^{-5} \text{ eV}^2$	$7,53 \times 10^{-5} \text{ eV}^2$
Δm_{31}^2	$2,5 \times 10^{-3} \text{ eV}^2$	$2,453 \times 10^{-3} \text{ eV}^2$
$\sin^2 \theta_{12}$	0,31	0,307
$\sin^2 \theta_{23}$	0,50	0,546
$\sin^2 \theta_{13}$	0,022	0,0220

Tabelle 1.1: T0-Vorhersagen vs. experimentelle Werte für Neutrino-Parameter

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