# Consistency Notes and Formula Reference for the T0 Model

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**Abstract**

This document contains notes on known consistency issues in the T0 model documentation, along with a comprehensive reference of mathematical symbols. It serves as a guide for readers of the documentation and as instructions for future revisions. The identified inconsistencies primarily concern the presentation of field equations, Lagrangian densities, and the notation of approximations.

## Contents

# 1 Known Consistency Issues

**Note to Readers**

The following list contains known consistency issues in the current T0 model documentation. These will be addressed in future revisions. Until then, this section serves as a guide to correctly interpret the various representations of the same concepts across different documents.

## 1.1 Inconsistent Marking of Approximations

**P1. Field Equation for $T(x)$**: The fundamental equation $\nabla^2 T(x) \approx -\frac{\rho}{T(x)^2}$ is sometimes presented without the approximation sign ($\approx$). This is inconsistent and should be marked as an approximation throughout all documents.

**Affected documents:**

- MathZeitMasseLagrangeEn.tex (Section 2)
- EmergentGravT0En.tex (Section 3.2)
- MassVarGalaxienEn.tex (Section 2.1)
- QMRelTimeMassPart1ZEn.tex (Section 5.1)
- NatEinheitenSystematikZEn.tex (Section 15.1)

## 1.2 Variants of the Lagrangian Density

**P2. Intrinsic Lagrangian Density**: Different versions are presented without clear distinction or explanation of the relationships between these variants:

**Simple version (free field dynamics):**

$$\mathcal{L}_{\text{intrinsic}} = \frac{1}{2}\partial_\mu T(x)\partial^\mu T(x) - \frac{1}{2}T(x)^2 \tag{1}$$

**With matter coupling:**

$$\mathcal{L}_{\text{intrinsic}} = \frac{1}{2}\partial_\mu T(x)\partial^\mu T(x) - \frac{1}{2}T(x)^2 - \frac{\rho}{T(x)} \tag{2}$$

**Complete form:**

$$\mathcal{L}_{\text{intrinsic}}^{\text{complete}} = \underbrace{\frac{1}{2}\partial_\mu T(x)\partial^\mu T(x) - \frac{1}{2}T(x)^2}_{\text{Free field dynamics}} + \underbrace{\bar{\psi}\left(i\hbar\gamma^0\frac{\partial}{\partial(t/T(x))} - i\hbar\gamma^0\frac{\partial}{\partial t}\right)\psi}_{\text{Interaction with matter}} \tag{3}$$

**Affected documents:**

- MathZeitMasseLagrangeEn.tex
- NotwendigkeitQMErweiterungEn.tex (Section 5.1)
- EmergentGravT0En.tex (Section 2.3)
- QMRelTimeMassPart1ZEn.tex (Section 4.1)

### 1.3 Parameters and Constants

**P3.** **$\kappa$-Parameter**: The derivation and dimension of the $\kappa$-parameter are represented differently:

**Variant 1:** $\kappa = \beta_T \cdot \frac{yv}{r_g^2}$ with dimension $[E]$

**Variant 2:** $\kappa^{\text{SI}} \approx 4.8 \times 10^{-11}\,\text{m/s}^2$ without explicit derivation

**Affected documents:**

- MassVarGalaxienEn.tex (Section 2.2)
- MessdifferenzenT0StandardEn.tex (Section 3.1)
- T0VereinheitlichungDEGalEn.tex (Section 4.2)

### 1.4 References and URL Structure

**P4.** **Inconsistent URL Structure**: The references to other documents in the series do not always follow the same pattern:

**Correct structure:**

- German: `/pdf/Deutsch/Filename.pdf`
- English: `/pdf/English/FilenameEn.pdf`

**Affected documents:** Various documents with inconsistent linking structure

### 1.5 Priorities for Future Revisions

The following measures should be implemented with priority in future revisions:

**M1.** Consistent marking of all approximations with the symbol $\approx$ in all field equations.

**M2.** Introduction of a consistent representation of the Lagrangian density with clear indications of which version is used in which context:

- Free field dynamics for propagation studies
- With matter coupling for gravity-relevant applications
- Complete form for comprehensive theoretical presentation

**M3.** Unification of the derivation and dimension of the $\kappa$-parameter with explicit connection between the theoretical form and SI value.

**M4.** Standardization of the URL structure in all documents according to the correct structure.

## 2 Formula Symbol Reference

**Mathematical Symbols of the T0 Model**

This reference contains the most important mathematical symbols of the T0 model with brief explanations.

## 3 Dimensions in Natural Units

| Symbol | Meaning |
|---|---|
| $T(x)$ | Intrinsic time field; fundamental field with dimension $[E^{-1}]$ |
| $T_0$ | Constant intrinsic time at rest mass |
| $\hbar$ | Reduced Planck constant; in natural units $\hbar = 1$ |
| $c$ | Speed of light; in natural units $c = 1$ |
| $G$ | Gravitational constant; in natural units $G = 1$ |
| $k_B$ | Boltzmann constant; in natural units $k_B = 1$ |
| $\alpha_{\text{EM}}$ | Fine-structure constant; in natural units $\alpha_{\text{EM}} = 1$ |
| $\alpha_{\text{W}}$ | Wien constant; in natural units $\alpha_{\text{W}} = 1$ |
| $\beta_{\text{T}}$ | T0 parameter; in natural units $\beta_{\text{T}} = 1$ |
| $\beta_{\text{T}}^{\text{SI}}$ | T0 parameter in SI units; $\beta_{\text{T}}^{\text{SI}} \approx 0.008$ |
| $\gamma_{\text{Lorentz}}$ | Lorentz factor; $\gamma_{\text{Lorentz}} = 1/\sqrt{1 - v^2/c^2}$ |
| $\xi$ | Ratio of T0 length to Planck length; $\xi = r_0/l_P \approx 1.33 \times 10^{-4}$ |
| $r_0$ | Characteristic T0 length; $r_0 = \xi \cdot l_P$ |
| $l_P$ | Planck length; $l_P = \sqrt{\hbar G/c^3}$ |
| $\Phi(r)$ | Modified gravitational potential; $\Phi(r) = -GM/r + \kappa r$ |
| $\kappa$ | Linear term in the modified gravitational potential; $\kappa \approx 4.8 \times 10^{-11}\,\text{m/s}^2$ |
| $\lambda_h$ | Higgs self-coupling; $\lambda_h \approx 0.13$ |
| $v$ | Higgs vacuum expectation value; $v \approx 246\,\text{GeV}$ |
| $m_h$ | Higgs mass; $m_h \approx 125\,\text{GeV}$ |
| $\omega$ | Angular frequency or photon energy |
| $\rho$ | Mass density or general energy density |
| $T(x)(\partial_\mu + igA_\mu)\Phi + \Phi\partial_\mu T(x)$ | Modified covariant derivative for Higgs field |
| $\mathcal{L}$ | Lagrangian density |
| $z$ | Redshift |
| $z_0$ | Reference redshift |
| $\lambda$ | Wavelength |
| $\lambda_0$ | Reference wavelength |

Table 1: Important mathematical symbols of the T0 model

| Physical Quantity | SI Unit | Dimension in Natural Units |
|---|---|---|
| Length | m | $[E^{-1}]$ |
| Time | s | $[E^{-1}]$ |
| Mass | kg | $[E]$ |
| Energy | J | $[E]$ |
| Temperature | K | $[E]$ |
| Electric Charge | C | [1] (dimensionless) |
| Electric Field | V/m | $[E^2]$ |
| Magnetic Field | T | $[E^2]$ |
| Force | N | $[E^2]$ |
| Pressure | Pa | $[E^4]$ |
| Vacuum Permittivity $\varepsilon_0$ | F/m | [1] (in nat. units $\varepsilon_0 = 1$) |
| Vacuum Permeability $\mu_0$ | H/m | [1] (in nat. units $\mu_0 = 1$) |

Table 2: Dimensions of physical quantities in natural units