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. κ-**Parameter**: The derivation and dimension of the κ-parameter are represented differently:

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

Variant 2: $\kappa^{\mathrm{SI}} \approx 4.8 \times 10^{-11}\,\mathrm{m/s^2}$ 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 κ-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 $k_B = 1$
α_{EM}	Fine-structure constant; in natural units $\alpha_{\mathrm{EM}} = 1$
α_{W}	Wien constant; in natural units $\alpha_{\mathrm{W}} = 1$
β_{T}	T0 parameter; in natural units $\beta_{\mathrm{T}} = 1$
$\beta_{\mathrm{T}}^{\mathrm{SI}}$	T0 parameter in SI units; $\beta_{\mathrm{T}}^{\mathrm{SI}} \approx 0.008$
$\gamma_{\mathrm{Lorentz}}$	Lorentz factor; $\gamma_{\mathrm{Lorentz}} = 1/\sqrt{1 - v^2/c^2}$
ξ	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; $\Phi(r) = -GM/r + \kappa r$
κ	Linear term in the modified gravitational potential; $\kappa \approx 4.8 \times 10^{-11}\,\mathrm{m/s^2}$
λ_h	Higgs self-coupling; $\lambda_h \approx 0.13$
v	Higgs vacuum expectation value; $v \approx 246\,\mathrm{GeV}$
m_h	Higgs mass; $m_h \approx 125\,\mathrm{GeV}$
ω	Angular frequency or photon energy
ρ	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
λ	Wavelength
λ_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 ε_0	F/m	$[1]$ (in nat. units $\varepsilon_0 = 1$)
Vacuum Permeability μ_0	H/m	$[1]$ (in nat. units $\mu_0 = 1$)

Table 2: Dimensions of physical quantities in natural units