

# A Theoretical Model of Force for Tachyonic Matter

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## Abstract

This paper explores a speculative force model for tachyonic matter based on the modified energy-momentum relationship attributed to particles with imaginary mass. The implications of such a model in classical and modern physics frameworks are discussed, alongside theoretical considerations regarding the nature of faster-than-light (FTL) particles.

## 1 Introduction

Tachyonic particles, those hypothesized to travel faster than light, challenge our conventional understanding of physics. This paper proposes a theoretical model for the force exerted by or on tachyonic matter, utilizing the modified energy-momentum relationship and speculating on the implications for such exotic particles.

## 2 Energy-Momentum Relationship

The foundational equation for the energy-momentum relationship of tachyonic matter is given by:

$$E^2 = p^2 c^2 - m_i^2 c^4 \tag{1}$$

where  $m_i$  represents the imaginary component of mass, and  $c$  is the speed of light.

## 3 Force Model for Tachyonic Matter

### 3.1 Momentum and Force

We define the force as the time derivative of momentum:

$$F = \frac{dp}{dt} \quad (2)$$

Given the momentum definition for tachyonic particles, we have:

$$p = \frac{\sqrt{E^2 + m_i^2 c^4}}{c} \quad (3)$$

The rate of change of momentum yields:

$$\frac{dp}{dt} = \frac{E}{c^2} \frac{dE}{dt} (E^2 + m_i^2 c^4)^{-1/2} \quad (4)$$

### 3.2 Force Equation

Thus, the force exerted by or on tachyonic matter can be expressed as:

$$F = \frac{E}{c^2} \frac{dE}{dt} (E^2 + m_i^2 c^4)^{-1/2} \quad (5)$$

## 4 Discussion

The implications of this force model are profound, suggesting nonlinear dependencies and unusual behaviors under varying energy conditions. This model also raises questions regarding the stability and interactions of tachyonic matter under normal physical conditions.

## 5 Conclusion

While purely speculative, this model provides a framework for further investigation into the properties and potential applications of tachyonic matter, encouraging deeper theoretical exploration and experimental approaches to verifying or refuting the existence of such exotic particles.

## References