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Tachyons: May they have a Role in Elementary Particle Physics?*

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"should be thoughts
Which ten time faster glide than the sun's beams
Driving back shadows over low'ring hills"

Shakespeare(1597)

ABSTRACT

The possible role of space-like objects in elementary particle physics(and in quantum mechanics) is reviewed and discussed, mainly by exploiting the explicit consequences of the peculiar relativistic mechanics of Tachyons. Particular attention is paid: (i) to tachyons as the possible carriers of interactions("internal lines"); e.g., to the links between "virtual particles" and Superluminal objects; (ii) to the possibility of "vacuum decays" at the classical level; (iii) to a *Lorentz-invariant* bootstrap model; (iv) to the apparent *shape* of the tachyonic elementary particles("elementary tachyons") and its possible connection with the de Broglie wave-particle dualism.

KEYWORDS

Special relativity; elementary particle physics; quantum mechanics; quantum field theory;space like objects; tachyons; virtual particles; vacuum decays; Bootstrap model; de Broglie waves.

1. INTRODUCTION

The subject of *Tachyons*, even if still speculative, may deserve some attention for reasons that can be divided into a few categories, two of which we wish to mention right now: (i) the large scheme that one tries to build up in order to incorporate space-like objects in the relativistic theories can allow a better understanding of many aspects of the *ordinary* relativistic physics (c.f. e.g. Recami, 1984, and refs. therein) even if tachyons would not exist in our cosmos as "asymptotically free" objects; (ii) Superluminal classical objects can have a role in elementary particle interactions(and perhaps in astrophysics); and it is tempting to check far one can go in reproducing the quantum-like behaviour at a classical level just by taking account of the possible existence of faster-than-light classical particles.

When facing the problem of extending Special Relativity(SR) to tachyons some authors limited themselves to consider objects both subluminal and Superluminal, all referred however to subluminal observers("weak approach"). The idea here is to postulate the Lorentz manifold, that

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