P9

On Possible Experimental Evidence for a Breakdown of Local Lorentz Invariance*

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We report the preliminary results of an experiment aimed at detecting a DC voltage across a conductor induced by the steady magnetic field of a coil. Two experimental runs, carried out with different apparati, showed positive evidence for such an effect, which might be interpreted as a breakdown of local Lorentz invariance. The new limits obtained by this new class of experiments are fully compatible with those already present in the literature for LLI effects.

1 - Introduction

The fundamental teaching of Einstein's relativity theories is that physical phenomena occur in four-dimensions (three spatial and one time dimension), space-time possessing a *global curved* (Riemannian) structure and a *local flat* (Minkowskian) structure. However, it is a long-disputed problem whether local Lorentz invariance (LLI) preserves its validity at any length or energy scale (far enough from the Planck scale, when quantum fluctuations are expected to come into play). Doubts as to the reliability of a Lorentz-invariant description of physical phenomena at subnuclear distances were, *e.g.*, put forward in the mid-sixties, even in standard (and well-known) textbooks[(1)].

From the experimental side, the main tests of LLI can be divided into roughly three groups[(2)]:

a) Michelson-Morley (MM)-type experiments, aimed at testing isotropy of the round-trip speed of light;
b) Tests of the isotropy of the one-way speed of light (based on atomic spectroscopy and atomic timekeeping);

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