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ON THE EQUIVALENCE PRINCIPLE

Abstract

The Equivalence Principle refers to several related concepts dealing with the equivalence of gravitational and inertial mass, and to Albert Einstein's assertion: "We (...) assume the complete physical equivalence of a gravitational field and a corresponding acceleration of the reference system." (Einstein, 1907).

It is possible to find new fields of research in the Equivalence Principle, and violations, in new rotational dynamics of non inertial systems. The foundations of rotational dynamics might be relevant to unsolved significant problems in physics.

This physical principle, fundamental in the current relativistic physics has been found reliably in a free-fall system. However, a free falling observable in a gravitational field is only a very specific case.

Systems in the universe are in motion, in constant dynamic equilibrium, being the free-fall an exceptional example. In the real universe, the general dynamic behaviour of rigid solids is characterized by its dynamic equilibrium. Through time, orbitation coexists with the intrinsic rotation.

In this scenario and not in the free-fall one, a significant exception to the Equivalence Principle may arise, if the starting points are non-inertial systems with specific dynamic assumptions.

With these dynamics assumptions, an observer could identify the nature of body motion and to identify if it is in a gravitational field, or is in an accelerated non-inertial system.

According to the proposed theory, we can conceive a universe in constant dynamic balance, in which a force momentum, with a zero resultant, will, as long as it operates, generate a movement of constant orbiting, within a closed path.

The importance of this mathematical model is obvious. In this model not only the forces are leading players, but also the momentums of those forces which, while staying constant, will generate orbiting and constantly recurrent movements, generating a system in dynamic balance, and not being in unlimited expansion. This new dynamics theory will give us a better understanding of how universe and matter behave.

We would suggest a detailed and deep analysis of dynamic hypotheses and propose the experimental testing necessary for confirmation. This would require the tests with models in orbit and with intrinsic rotation.

This field of research may allow the knowledge of new space systems and brings potential applications for the future, along with numerous relevant technology developments to prepare the future orbital infrastructure.