THE TETRAD METHOD FOR ELECTROMAGNETIC FIELD IN ROTATING FRAME OF REFERENCE

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Abstract. The need for finding electromagnetic field in rotating frame of reference appears in designing of electrical motors and generators. This leads to the problem of a proper form of Maxwell equations in such a non-inertial frame of reference and the problem of finding formulas for field transformation in the case of change of inertial frame to non-inertial one. By the use of the tetrad method it is shown that in linear in v/c approximation in cylindrical coordinates the Lorentz formulas can be used for transformations into rotating frame of reference and usual form of Maxwell equations in these coordinates can be used in rotating frame of reference.

1. Introduction

Field methods give the most exact results in designing process of electrical machines such as electrical motors and generators. Thus precise knowledge of distribution of electromagnetic field in the machine is very important. Because the rotator forms a non-inertial frame of reference the serious problem of finding electromagnetic field in this region appears. There are two ways of solving this problem. First, proper transformation formulas from inertial to non-inertial frame can be used. Second, a proper form of Maxwell equations in non-inertial rotating frame of reference can be used. These two ways are addressed in this paper with the use of the tetrad method. The results of this paper were used in the just being prepared paper presenting numerical modeling of magnetic field in real turbo generator.

In the engineering literature the above problem is often unnoticed or ignored. The Lorentz formulas are frequently used without any comments. Other authors have ignored the problem invoking non-relativistic approximation. Rotation in electrical