

Volume Density of Power of Multivector Electric Machine

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Abstract : Since the invention, the electric machine (EM) can be defined as oEM – one-vector electric machine, as it works due to one-vector inductive coupling with use of one-vector electromagnet. The disadvantages of oEM are large size and limited efficiency at low and medium power applications. This paper describes multi-vector electric machine (mEM) based on multi-vector inductive coupling, which is characterized by the increased surface area of the inductive coupling per EM volume, with a reduced share of inefficient and energy-consuming part of the winding, in comparison with oEM's. Particularly, it is considered, calculated and compared the performance of three different electrical motors and their power at the same volumes and rotor frequencies. It is also presented the result of calculation of correlation between power density and volume for oEM and mEM. The method of multi-vector inductive coupling enables mEM to possess 1.5-4.0 greater density of power per volume and significantly higher efficiency, in comparison with today's oEM, especially in low and medium power applications. mEM has distinct advantages, when used in transport vehicles such as electric cars and aircrafts.

Keywords : electric machine, electric motor, electromagnet, efficiency of electric motor

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