عنوان مقاله:

Magnetic Force Calculation of Movable YBCO Superconducting Helical Coils Applicable to Electric Vehicles Wireless Power Transfer

محل انتشار:

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خلاصه مقاله:

kground and Objectives: Today, replacing gasoline-powered vehicles with electric vehicles (EVs) and connecting them to an electric power source have made the optimal usage of energy-saving resources. Therefore, wireless Power Transfer (WPT) outstands as an alternative technology to improve the user perception about the charging process of the EVs. Superconducting coils (SCs) with high-temperature have an applied feature in decreasing losses of wireless power transmission (WPT). The Magnetic force has effects of overall deformation modes between two current carrier superconducting coils, i.e. axial extension, torsion, and bending. Coil misalignment is a fundamental problem and its impact on wireless power transmission efficiency is very complex. The analysis of a magnetic force which is presented in this paper are beneficially for the design and application of the WPT systems. Here, a fast analytical solution is presented to obtain the magnetic force between the transmitter and receiver helical superconducting coils in different positions.Methods: In this paper, a new method applied to solve the numerically magnetic force solutions in different superconducting coils mismatch states for WPT. Finally, for improvement of efficiency, the WPT system has been designed on the basis of mutual inductance changes which receiving helical coil was moved inside the transmitting helical coil. Hence, the magnetic force calculation of movable YBCO superconducting helical coils inside each other is presented. These models have been compared with the FEM.Results: Results show that the presented equations are reliable as well. According to the comparing the analysis and FEM data, the obtained results indicated the errors with less than ۰.۰۰۶۴%. Also, results show an excellent agreement with respect to the finite element method.Conclusion: In this paper, the numerical solutions of magnetic force in different superconducting coils mismatch states were solved by a new method. The magnetic force analysis basics introduced in this paper are useful to develop and apply for wireless power transmission system. The simulation results show that only by applying some constraints, the efficiency of the transmitted wireless power will be optimized. Then, analytical models have been presented which make it possible to calculate the axial force which was exerted between two axially Helical magnetized and two thin coils in air. Also, the analytical stiffness calculation applied between these distributions of magnetic source has been ... presented. These models have been compared with the FEM

کلمات کلیدی:

Magnetic Force, Mutual inductance, Non-alignment, wireless power transmission, superconducting helical coils