A Simulation Study of Wireless Power Transfer for Electric Vehicle

M. M. I. Mohd., M. S. Bakar, and M. S. Jadin

Abstract This study proposes a wireless power transfer (WPT) simulation for electric vehicle (EV) charging. Using the latest WPT technology rather than traditional charging, this study analyses the best way for boosting power transfer in internal combustion engine (ICE) vehicles. In a WPT system for EV applications, compensating circuits are critical for increasing WPT capacity and power transfer efficiency. Compensation topologies such as series-series (SS), series–parallel (SP), parallel-series (PS), and parallel-parallel (PP) each have their own set of advantages and limitations. It is found that, due to their load resistance of 1 kΩ, high coupling coefficient of 0.5, and capacity to operate at 86 kHz, the SP topology is more viable to employ as a composition circuit for WPT system in EV charging.

Keywords Wireless power transfer · Electric vehicle · Topology

1 Introduction

1.1 Background

Since N.Tesla [1], wireless power transfer (WPT) has been in use for almost 100 years. Tesla's first WPT device has been unveiled. WPT uses inductive power transfer (IPT) technology to provide users with a safer charging mechanism. In a WPT system for EV applications, compensating circuits play a vital role in boosting both the capacity and the efficiency of wireless power transfer. Series-series (SS), series–parallel (SP), parallel-series (PS), and parallel-parallel (PP) are the four compensation circuit topologies [2]. Each topology has its own set of benefits and drawbacks, but this would substantially improve the user-friendliness of EVs and aid in the replacement of internal combustion engine (ICE) vehicles, improving fuel sustainability. Magnetic coupling from a stationary primary source to one or more moving

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