Development of Class EF power converter for wireless charging applications

Basic Information

Project ID: AEE-2020-23

Students: Olli Auranen, Xiaowei Du, Aniket Kulkarni, Pyry Veijalainen

Project manager: Pyry Veijalainen

Instructor: Prasad Jaythurathnage

Other advisors: Bahman Eskandari

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Abstract

The goal for our project was to investigate, design and develop a class EF power converter for wireless charging of electric scooters. The intention was that this device could be used to wirelessly charge devices like the e-scooters in order to improve the usability of commuting devices that can utilize renewable energy sources. The objective of the project was to build a wireless converter that can charge devices up to a distance of 10cm in order to provide true wireless charging and allow less strict positioning for the devices that will be charged.

We first simulated coil designs and solved the component values needed for the specific application criteria. Then we simulated the components using LTspice to verify that the circuit is working as intended and to confirm that the current and voltage levels and performance was acceptable. We achieved a theoretical efficiency of 90% for the required power level.

During the business pitch of the project, we analysed the markets for the proposed solution and identified the key competitors for the device. Most of the competitors that tried to do some wireless charging were using a more traditional way of wireless charging, therefore they could be turned into potential customers. The market for this type of wireless charger is completely new and the amount of devices where this could be applied is constantly growing.

After the simulations, we designed the schematics and the PCBs. However, due to the Coronavirus, we could not access the laboratories just after we had made the component orders. Therefore, we redefined the goal of the project to work on a better solver for the component values as well as simulate a system that does not do a simple one way on-off switching but uses push-pull configuration to make the voltages and currents symmetrical during the operation.