

Predicting Radiated Emissions of eBikes

Master's thesis

In the recent years, eBikes evolved rapidly. They are now available in a broad range of categories, e.g. commuter bikes, eMTBs or cargo bikes. These bicycles vary significantly in terms of their geometric design and in terms of their component configuration. Robert Bosch GmbH plays a leading role in developing electrical eBike systems. In an eBike system, electronic and electromechanics components, like motor, battery, control unit, etc., are interconnected with cable harnesses.

Managing the electromagnetic compatibility (EMC) of eBikes is a huge challenge:

- Computational models are required in order to predict the radiated emissions of a configuration, to find more suitable designs related to EMC, cost and weight requirements—as well as to search for the root causes of resonances seen in the emission spectrum that exceed the limits of radiated emission.
- Those models should ideally be quick to compute, consider the uncertainties of material properties, geometry etc. and match measurements precisely.

Goal of the thesis:

- 1) Modeling and simulation of a simplified eBike system
- 2) Validation of the simulation results against measurements

Prerequisites:

Strong background and interest in electromagnetic field theory; basic skills in Matlab/Python, CST Studio Suite

The thesis is supervised by the EMC department and Corporate Research of Robert Bosch GmbH in cooperation with the TU Darmstadt.

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