

Bachelor/Master Thesis

Transmission Line Measurements

Objective

The rapid increase of the conversion efficiency of perovskite solar cells due to their enormous potential provides a very promising possibility to improve the efficiency of various solar modules significantly to potentially over 35%. For an efficient extraction of the charge carriers, interconnection lines of thin-film solar modules are necessary. However, they reduce the active area of the solar modules and thus lower their overall efficiency.

Laser-scribing of interconnection lines of Perovskite thin-film solar modules has already been demonstrated to be a promising technique for high accuracy low-cost interconnection fabrication. Nevertheless, it raises new challenges regarding ablation mechanism, debris redeposition and degradation due to heat. Therefore, a transmission line measurement (TLM) setup is envisaged to provide detailed information about the electrical contact resistance between the electrodes of laser-scribed perovskite solar modules to evaluate optimal laser pulse parameters.

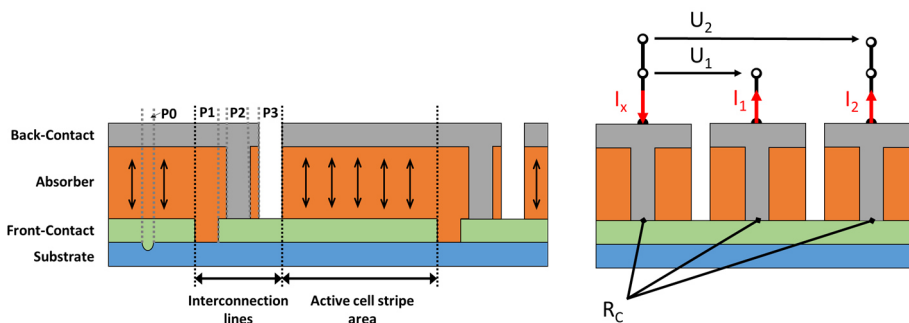


Figure 1: (Left) Interconnection of electrodes in perovskite solar modules and (right) schematic of a transmission line measurement [1]

The scope of work includes the design and installation of necessary TLM setup components, creation of a setup control program (LabVIEW) including a clear UI and the validation of the setup's functionality. The work concludes with a subsequent experimental optimization study of the respective contact resistance in self-made laser-scribed modules.

The facilities of the Institute of Microstructure Technology will provide a perfect environment for insights in interdisciplinary work between physics, mechanical and electrical engineering. The candidate will get the opportunity to work in a young and highly motivated international team and will get precious experience.

Prerequisites

We are looking for a candidate with a strong affinity for development and experimental work. In addition, a fundamental understanding of photovoltaics is indispensable. The ideal candidate should have a strong drive to engage with research activity that often implies addressing novel challenges. Prior experience with LabVIEW as well as lab experience will be advantageous. This is a multidisciplinary project, so a will to broaden horizons and strengthen a diverse set of skills is also desirable.

Research Group

“Advanced Optics and Materials for Next Generation Photovoltaics” of IMT / LTI

Research areas

Solar Energy, Nano-photonics, Micro and Nanosystems

Places

IMT (KIT, Campus North)
LTI (KIT, Campus South)

Focus

Development, Validation, Characterization

Study path

Physics or
Optics & Photonics or
Electrical/Mechanical engineering

Application period

Spring 2020 / Earlier

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[1] Following drawing from “Laser processing for the integrated series connection of thin-film silicon solar cells”, B. Turan, 2016