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Development of a Multispectral LEDs-based Source for Nanoparticles Excitation

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All over the world, scientists and physicians are searching for new methods to treat cancer. A potential alternative could be a therapy based on a photo thermal treatment. The process of this treatment is somehow similar to fever. The heat kills the tumour cells and makes them more sensitive to a potential following radiation therapy. This advantage is a main reason for a further research with stimuli responsive nanoparticles that can generate heat when exposed to an electromagnetic radiation. Before being used clinically, the ability of the nano-particles to generate heat should be investigate in details. In collaboration with the Adolphe-Merkle-Institute of University of Fribourg, a multispectral LED-based excitation device has been developed for this specific purpose.
The device is able to stimulate the nanoparticles with light those wavelength is ranging from visible to near infrared (i.e. from 400 nm to 950 nm). Due to the oscillation of the nanoparticles caused by the light excitation, they heat up. An infrared camera captures the thermal radiation generated. The collected data is evaluated using the Lock-In thermography method (LIT).
The aim of this bachelor thesis was to redesign the new multispectral LED-based source for nanoparticles excitation, developed during former projects. The main focus was set on im-plementing a multispectral, intense and homogeneous LED-based light source, together with a dedicated electronic driver. The electronic and software outline of the project thesis were subsequently put into practice, to run the multispectral LED-based source. For realization, the development and the fabrication of a printed circuit board and a standalone LabVIEW program became necessary. Measurements were conducted to assess the homogeneity and the light power delivered by the device.
Nevertheless the light power could be more effective. Besides a further adaption of the software and additional measurements are necessary to assess the light intensity more pre-cisely. We also suggest to implement a new stimulation technique: „Frequency-Modulation-Method" that should lead to higher signal to noise ratio (SNR).

Optimized multispectral LED-based excitation device