# CONCENTRATED SOLAR RADIATION MEASUREMENT WITH VIDEO IMAGE PROCESSING AND ONLINE FLUXGAGE CALIBRATION

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The measurement of concentrated solar radiation in the focus of a power tower facility is very important to be able to determine the input/output characteristic of the receiver. The recently introduced flux measurement system PROHERMES performs solar flux density measurement and analysis for the solar tower receiver entrance aperture in the focus of the CESA heliostat field at PSA, Spain.
To obtain the flux distribution a white diffusely reflecting ”Lambertian” target-slat, called moving-bar, is rotated in front of the receiver. The actually applied white coating of the moving bar plates has been compared to plasma-sprayed coating and showed good performance in this application. Lambertian law is sufficiently fulfilled and shining only minor.
The 14-bit-Video-Camera system is being calibrated on-line to physical units with two Thermogage flux sensors fixed in the receiver aperture close to the measurement plane. The calibration shows very good linearity and reproducibility whereas the absolute flux value obtained from the Thermogage circular foil heat flux gage introduces an error of 3-5 % to the evaluated total power. Flux gages have been compared to each other in set-ups at PSA central receiver systems. A significant improvement is related to the use of the new generation flux gages (Vatell, US) with copper body.
For a measurement the moving bar is being launched and rotates trough the focus and back. The acquired set of snap shots showing the moving-bar at different positions on the irrelevant background, has to be assembled to a resulting image representing flux densities over the whole receiver aperture reaching up to 800 kW/m$^2$. In contrary to former concepts with synchronisation between the image acquisition system and the moving-bar drive, new methods of pattern recognition have been applied.
The algorithm has been implemented in the PC image-processing environment OPTIMAS. This way a user-friendly and flexible receiver input-power measurement tool has been embedded into the cost-efficient PC-based flux measurement system PROHERMES. Application of this method in the REFOS project testing a pressurized volumetric air receiver lead to good experiences.
The paper will describe the system’s concept, implementation of improvements and obtained results. The PROHERMES system consists of few components and has only minor impact on the receiver operation. This makes the system applicable and interesting for future R&D projects as well as for commercial plants, where the control of the heliostat field could be combined with this optical measurement system for automation.