

SHORT

Scalable Heliostat Calibration System for Solar Tower Plants

TECHNOLOGY TRANSFER / LICENSING OPPORTUNITY FOR CHINA

Patented camera-based technology for automatic, parallel calibration of heliostats by identifying the real kinematic model of each unit.

Executive Summary

SHORT is a patented camera-based calibration technology for large solar tower heliostat fields. It is designed to identify the real kinematic model of each heliostat, rather than applying only a simple angular offset. A low-cost camera is mounted on each heliostat and observes known targets distributed around the solar field. By comparing observed target positions with the theoretical model, SHORT estimates the real heliostat movement and generates calibration parameters that improve pointing and tracking.

The technology is especially relevant for very large tower plants, where conventional tower-target calibration is sequential, slow and unreliable for distant heliostats. SHORT enables automatic and parallel calibration, potentially at night, without interfering with normal plant operation. It is a protected technology available for technology transfer and licensing to a Chinese industrial partner capable of completing product adaptation, industrialization and commercial deployment.

Why SHORT Matters

Heliostat calibration is essential to reduce tracking errors, optimize flux on the receiver and increase the energy production of a tower CSP plant. Large fields include thousands or even tens of thousands of heliostats, and small tracking errors can become a material performance issue at plant level.

Conventional calibration is based on pointing a heliostat to a tower target, taking an image of the reflected spot and repeating this process one heliostat at a time. This approach is slow, labour intensive and not fully applicable to long-distance heliostats, where the reflected spot may have low power density, become larger than the target, or be difficult to locate accurately.

How SHORT Works



SHORT installs a low-cost camera on each heliostat, rigidly connected to the mirror structure. The camera observes known targets placed in or around the solar field. These targets may be artificial lights, recognizable objects, the moon or other reference points with known positions.

With multiple observations, the system compares what the camera sees with what should be seen according to the theoretical model. It then adjusts the parameters until it obtains the real kinematic model of the heliostat, including mounting errors, real azimuth and elevation axes, mechanical deviations and tracking behaviour. The corrected parameters are then available for the heliostat controller.

Key Advantages

Actual kinematic model	Parallel calibration
Calibrates each heliostat's real movement, not only angular offsets.	Many heliostats can be calibrated simultaneously, improving scalability.
Night operation	Lower commissioning effort
Calibration can be performed at night, avoiding interference with normal plant operation.	Reduces field calibration time, assembly constraints and long-term mechanical stability requirements.

Validation and Current Maturity

SHORT has been validated at CIEMAT-PSA using an embedded prototype including camera, filter, processor and communications. The available technical material reports tracking error below 0.25 mrad RMS. Additional validation material shows low-cost camera testing, target observations and improvements in robustness, automation and error-source identification.

For the Chinese market, the recommended positioning is: validated patented technology ready for transfer to an industrial partner for product adaptation, integration with heliostat control systems, industrialization and local deployment.

Intellectual Property

International publication: WO2017/055663

PCT application: PCT/ES2016/070681

China publication: CN108139556A

China granted reference: CN108139556B

Chinese title: 用于表征反射表面的方法、装置和系统

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Holder: Fundación CENER (Centro Nacional de Energías Renovables)

Licensing Opportunity for China

CENER is seeking a Chinese industrial partner to license and complete the industrialization of SHORT for local manufacturing, integration and commercial exploitation in China. Ideal partners include heliostat manufacturers, heliostat control-system suppliers, solar-field automation companies, EPC contractors, tower CSP developers and plant owners.

The expected partner role is to adapt the technology to local plant requirements, integrate it into commercial heliostat/control platforms, industrialize the hardware/software package, and deploy it with Chinese CSP projects.

Partner with CENER to industrialize a patented European technology for scalable heliostat calibration in China's next generation of solar tower plants.