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## **FLUX DENSITY DISTRIBUTION DATABASE OF SINGLE HELIOSTATS AT THEMIS**

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# FLUX DENSITY DISTRIBUTION DATABASE OF SINGLE HELIOSTATS AT THEMIS

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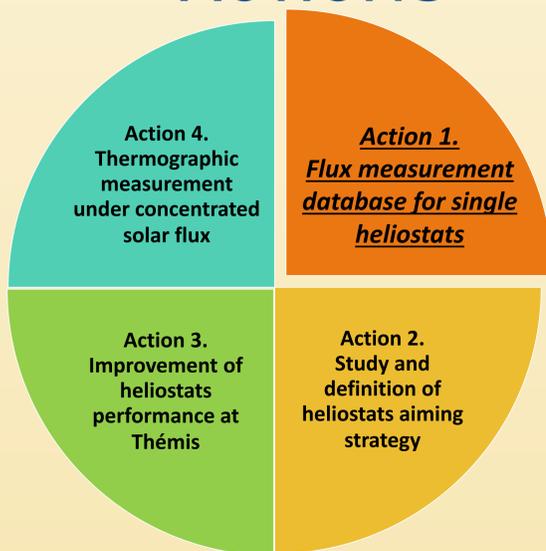
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The FEDER CLE-DE-SOL project has the objective of controlling the concentrated solar power and the temperature at the focus of the Thémis tower power plant (Targassone, France) and the 1000 kW solar furnace in Odeillo.

To achieve it, the objective is divided into 4 actions, and this work is focused on the first action: to build a flux measurement database for single heliostats at Thémis plant. This action aims to measure the concentrated solar energy incoming from different single heliostats at a representative sampling, to then establish an interpolated database as general as possible. A database was constituted at the Big Solar Furnace but invalidated, and the measurements are in progress at Thémis.

## ACTIONS



Thémis solar power tower (SPT) R&D facility at PROMES-CNRS is a 5 MWth of 110 m high and a solar field with 107 heliostats (Figure 1). It has a flux measurement system that consists of a white moving bar with a radiometer (Figure 2) and a digital camera. The data of DNI (Direct Normal Irradiance) is registered by a pyrhelimeter Kipp & Zonen CH1. The digital camera is a Basler 16 bits, with a Sony IMX174 CMOS sensor (1920x1200 pixels). The radiometer is a fast heat flux micro-sensor, model HFM6 supplied by Vatel (Figure 3).



Figure 1. Thémis SPT

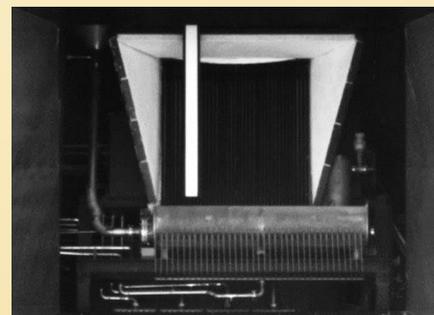


Figure 2. Moving bar and radiometer

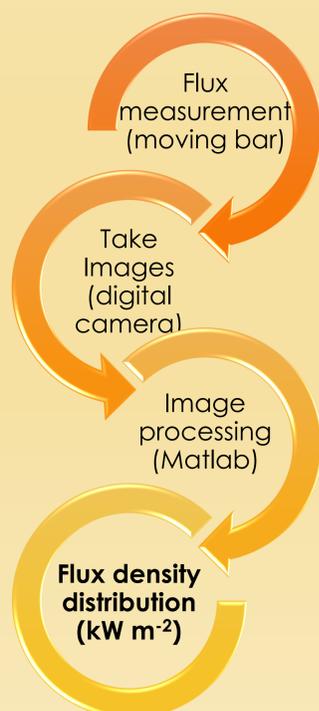


Figure 3. Pyrhelimeter and radiometer

## Building the flux density distribution database of single heliostats.

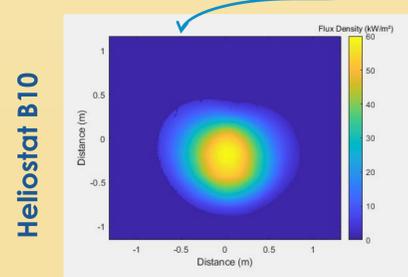
The database is created with flux density distributions ( $\text{kW}\cdot\text{m}^{-2}$ ) from single heliostats within Thémis heliostat field. The measures have been taken for a sample of 24 heliostats, at different hours of the same day, and on different days, for a few months. This database is constantly being increased until having around one year of measurements.

### Flux measurement method

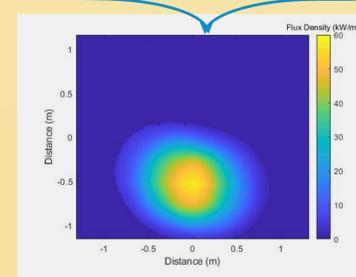


### Different day-Different hour

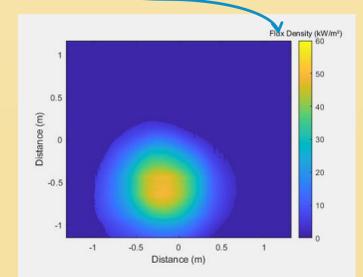
### Same day-Different hour



**Heliostat B10**  
Power: 38,4 kW  
Peak Flux Density: 62  $\text{kW}\cdot\text{m}^{-2}$   
19/08/2022  
13:53:39 h



Power: 39,1 kW  
Peak Flux Density: 48  $\text{kW}\cdot\text{m}^{-2}$   
23/03/2022  
12:20:42 h



Power: 36,9 kW  
Peak Flux Density: 43  $\text{kW}\cdot\text{m}^{-2}$   
23/03/2022  
15:46:51 h

