

**Location of the infrastructure:** Madrid, Spain

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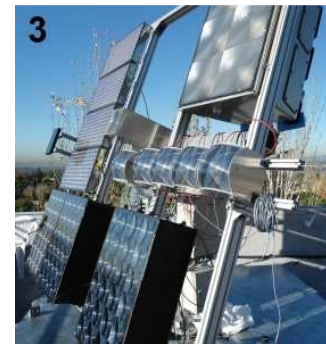
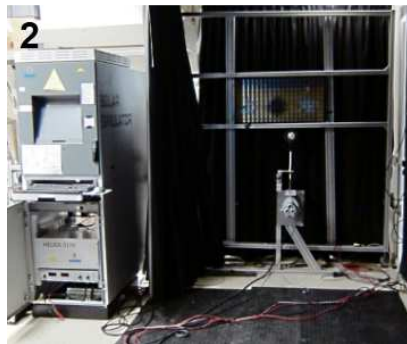
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**Objectives:** Characterize all aspects of CPV performance, both components and modules.

**Main features:**



- 1. Pulsed Solar Simulator for Cells**
  - Concentrated light (up to 1000 suns) with spectral monitoring.
  - Single and multi-flash lighted I-V curve system
  - Thermally controlled measurement plane
- 2. Pulsed Solar Simulator for CPV Modules and Optics**
  - Large area (2m diameter) highly collimated ( $\pm 0.4^\circ$ ) light source for indoor measurement at standard test conditions. Irradiance adjustable to 1200W/m<sup>2</sup>.
  - I-V curve measurement system synchronized to flash
  - Spectral monitoring to ensure match to standard conditions
  - Ability to precisely rotate module for direct transmission curve measurement
  - Ability to take high resolution indirect transmission curves based on electroluminescence
  - Large temperature controlled chamber for lighted testing of modules and optics up to 100°C
  - Imaging setup for directly measuring concentrated light flux map of lenses and glass optics.
- 3. Outdoor CPV Test Bench**
  - Test tracker with 10m<sup>2</sup> aperture and reconfigurable frame and 0.1° accuracy
  - Continuous measurement of I-V curves for up to four modules at sub-minute time intervals, along with up to eight temperature sensors.
- 4. Meteorological station**
  - Equipped with redundant pyrheliometers as well as other standard equipment
  - Continuous spectral monitoring with spectrometer and isotope cells.



**Limitations:** The access will be allowed with technical and scientific assistance from the IES.

**Typical services or results:**

- Measurement of CPV module maximum power and acceptance angle at standard conditions, or other conditions as required
- Calibration of reference modules for use in indoor test
- Combined system and component level testing to determine causes of performance losses
- Determination of sensitivity of modules, cells, and optics sensitivities to spectrum and temperature.
- Monitoring of module performance during prolonged outdoor exposure.

**Examples of research projects:**

- Studies of CPV performance behaviors
  - Performance of concentrator cells in uniform and non-uniform light
  - Effect of temperature on SOG lens performance
- Development of new concentrator technologies
- Development of novel characterization techniques.
  - Determination of current matching condition in concentrator MJ cells at different spectra
- CPV Standards development