

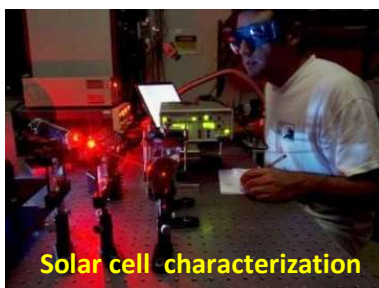
Solar Energy Institute

The Solar Energy Institute is the oldest research institute of the Universidad Politécnica de Madrid –founded back in 1979– and it is a worldwide renown research center in the field of Renewable Energies. We are a center fully focused on the photovoltaic conversion of light into electricity, covering all aspects in the value chain. We do materials science around photovoltaic materials; we devise, manufacture, measure and simulate solar cells to improve their performance and produce more cost effective devices; we search for solutions to the challenges that PV technology is facing, all the way from the source material to utility scale solar installations, including the characterization of multi-MW plants, the application of PV in novel fields or the development of more efficient strategies for demand-side management or the use of batteries to ease PV integration into the electricity grid.

Facilities and infrastructures



Solar cell manufacturing



Solar cell characterization

The Solar Energy Institute is equipped with state-of-the-art facilities for Photovoltaic research distributed along their three sites in Madrid. We have a fully operational lab-scale solar cell production line where different materials can be manufactured and measured, then processed into solar cells and characterized to assess their efficiency to be finally submitted to accelerated ageing tests in climatic chambers to evaluate their lifetime. We have solar simulators and outdoor test facilities for the measurements of solar modules of diverse technologies. We have a solar home where PV building integration, demand-side management and smart-grid technologies can be put to the test.

We have portable systems for the field measurement of multi-MW utility scale photovoltaic power plants. In short, we are home to most pieces of equipment needed to understand and improve PV materials, cells, modules and power plants.



Silicon crystal pullers

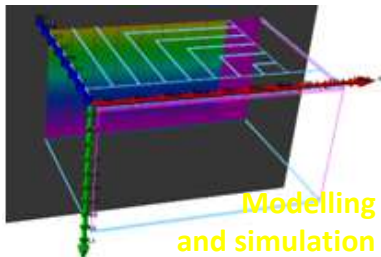
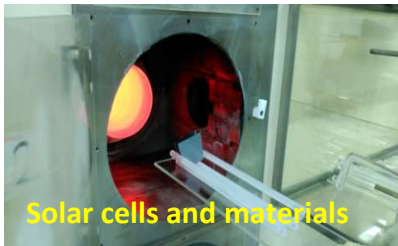


MBE reactor



MOVPE reactor

Research areas associated with Big Science



Main projects in Big Science

- *INTEGRATED OPTICAL POWER TRANSFER/DATA RETRIEVAL LINK. ESA Technology Research Programme (Partners: UPM/ESA): this project aimed at building a prototype of a complete power-by-light system for a spacecraft.*
- *ACTIVATION ENERGY FOR ACCELERATED TESTS IN MULTIJUNCTION SOLAR CELLS. ESA Technology Research Programme (Partners: UPM/ESA): the goal of this project was to study the accelerated degradation in climatic chambers of space multifunction solar cells and find the activation energies for the key degradation processes.*
- *THREE-TERMINAL SOLAR CELLS FOR SPACE APPLICATIONS (Partners: UPM/ESA): multi-terminal solar cell architectures were here investigated in search of higher end of life (EOL) efficiencies.*
- *ANALYSIS OF THE FEASIBILITY OF NOVEL SOLAR CELL CONCEPTS FOR SPACE APPLICATIONS (Partners: UPM/ESA): the goal was to investigate photovoltaic novel concepts for space missions.*
- *PHOTON ENHANCED THERMOIONIC EMISSION FOR SPACE POWER SYSTEMS (Partners: UPM/ESA/CNM-CSIC/IIT): this project investigated the feasibility of using the photon-enhanced thermionic emission concept to enable high temperature power generation.*

Collaboration with Large European Scientific Facilities

- *ESA: collaboration in the Technology Research Programme (TRP) Innovation Triangle Initiative.*

Software, tools or licenses to be applied to Big Science

- *At the Solar Energy Institute we work with a broad set of software tools for the modelling and simulation of different photovoltaic problems.*
- *From solar spectra to photovoltaic materials; from new solar cells to state-of-the-art photovoltaic panels, arrays or plants, we can model their performance under different conditions.*
- *Most of such are home-made pieces of code built and expanded along years of dedicated research.*
- *Commercial tools as SILVACO ATLAS, LightTools, PVSyst are also available.*

UPM contact:

Prof. Ignacio Rey-Stolle
ignacio.reystolle@upm.es
Dr. Pablo García-Linares
p.garcia-linares@upm.es