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## **CABLE SOLAR Project : CAptive Balloons for aLtitudE SOLAR farms**

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## CABLE SOLAR Project : Captive Balloons for altitude SOLAR farms

### Main goal

Development of a long-duration flying platform using photovoltaic energy and thin film solar cells architecture to produce electricity

### Main Objectives

- Durable Captive balloon autonomous in energy
- Developing an airborne platform for solar cells characterizations

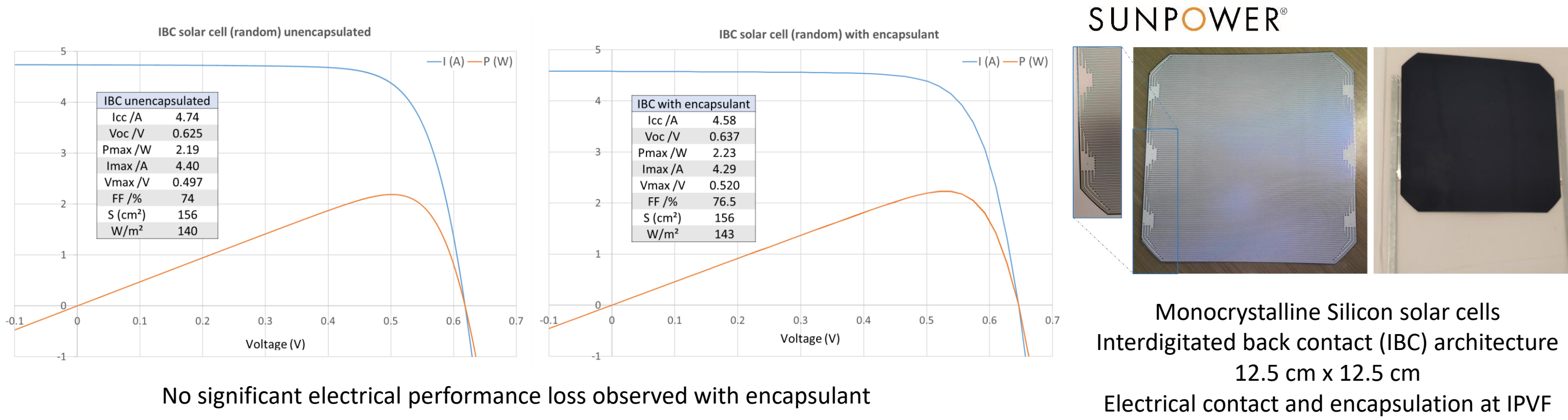
### Main achievements

- Electrical contacts, Encapsulation and I/V characterization were performed on isolated solar cells
- The first two "on scale PV-ring" using Si and CIGS solar cell technologies have been designed and realized
- Installation of the winching station and first flights realized with Tankers SAS

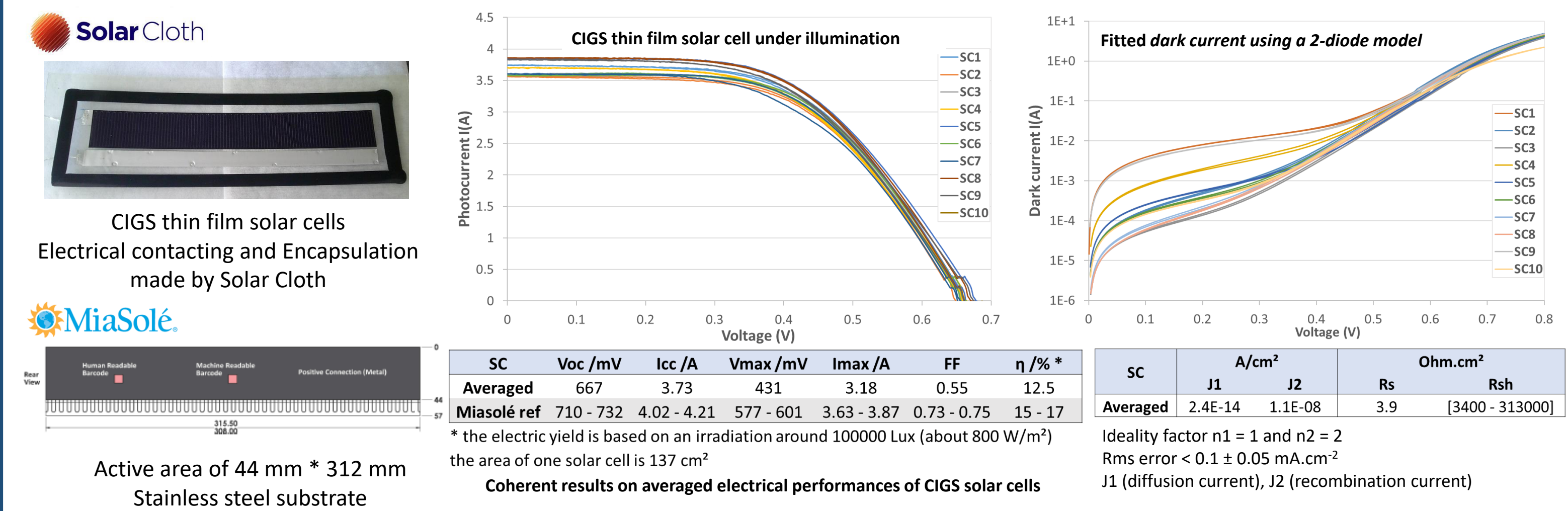


### Solar cells electrical characterization & On-scale module design

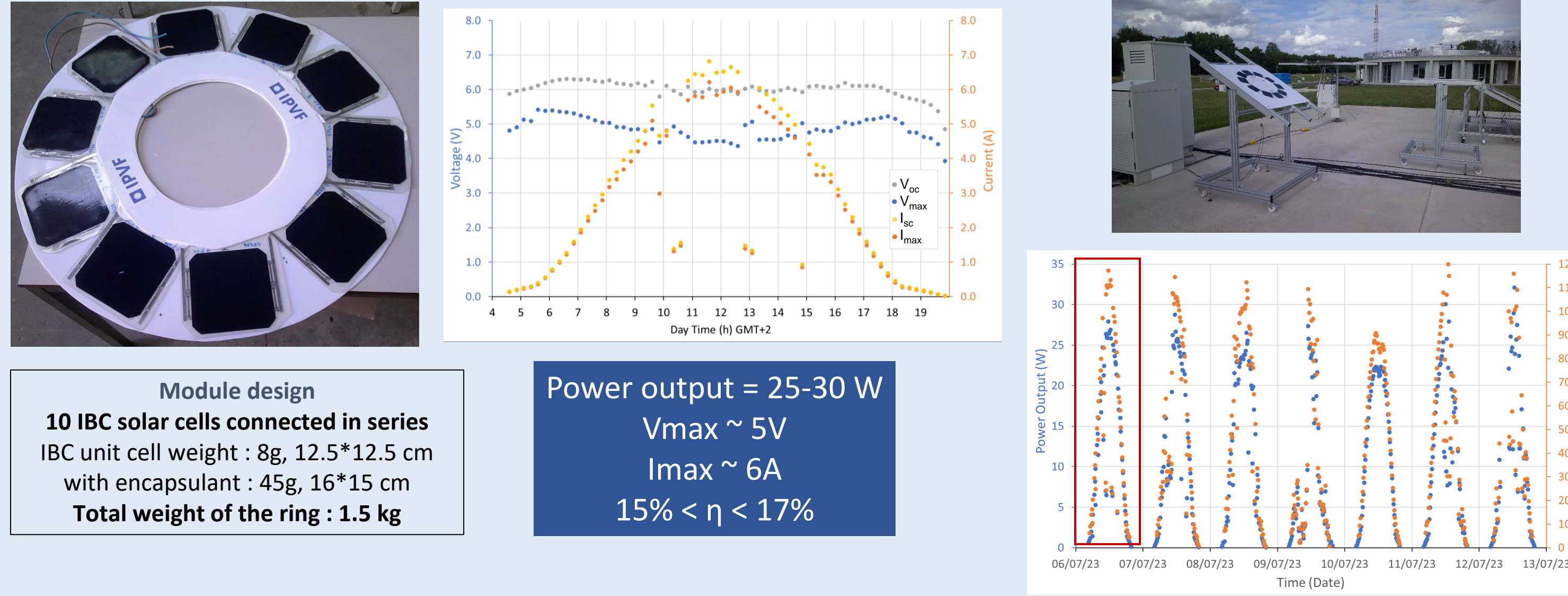
#### Si solar cells encapsulated at IPVF with indoor I/V characterization



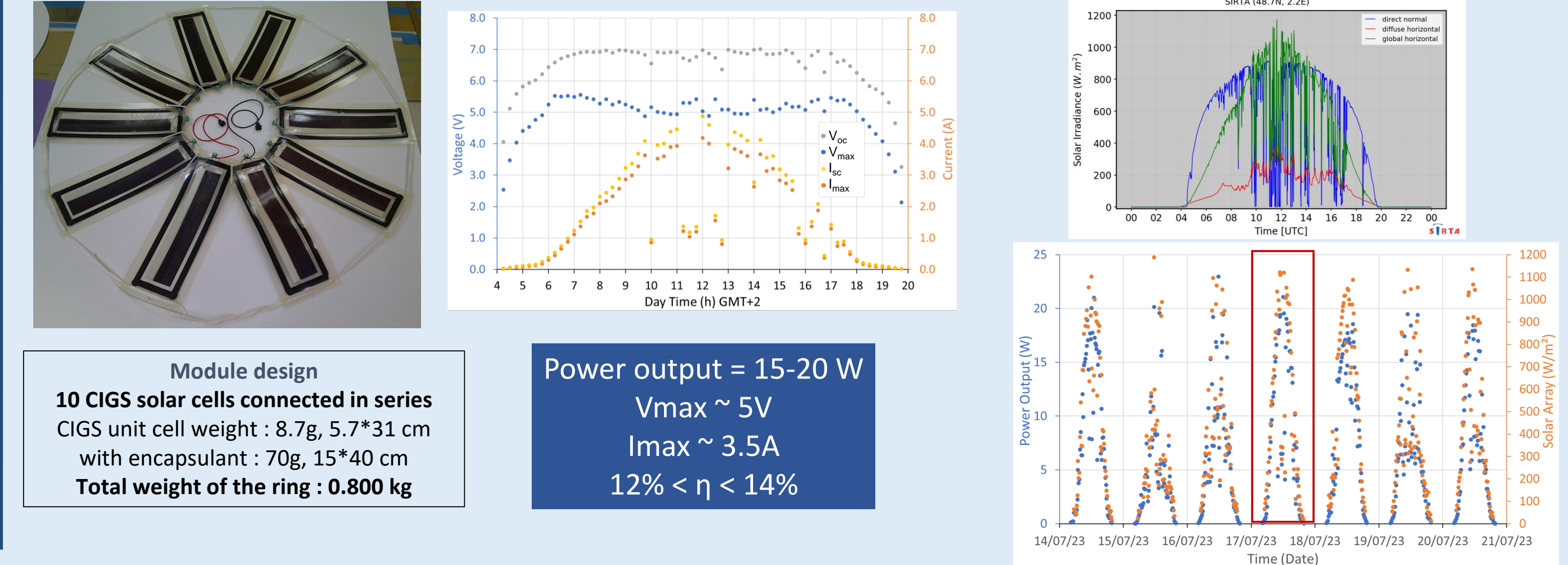
#### CIGS thin film technology with outdoor I/V characterization at SOYPV



#### Outdoor electrical measurements at SIRTAs



#### Outdoor electrical measurements at SIRTAs



### PV integration and first flight



Indoor tests at Tankers building

Platform of flight and PV installation

First flights in June 2023

#### Description of the platform

- Captive balloon**
  - 4 m diameter Sphere
  - 30 m<sup>3</sup> of Helium
  - 4G communication
  - Environmental sensors
  - 50 meters of altitude
  - PV ring for battery loading
- Stabilization**
  - 1 overall net
  - 3 deported cable pulley sealed on ground
- Ground station**
  - 1 electric winch sealed on ground
  - Connected anemometer
  - Wind alert communication
  - Manual and remote control
  - 12V battery monitoring with a 120W PV panel

### Under progress... and Forecast

- Embedded system for airborne measurement of the PV production
- Sensor network under development → distribution of the solar array on the balloon vs daytime
- Array simulation in LAAS laboratory → optimization of the PV architecture
- Next flight campaign at SIRTAs-IPSL meteorological measurements platform in preparation
- Bibliographic study and technico-economic assessment in progress



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