Soil Test GUI Manual

Date : 3rd December 2025

Software version : 5_5_34_soil_irradiance_test

Manual version: 2.0

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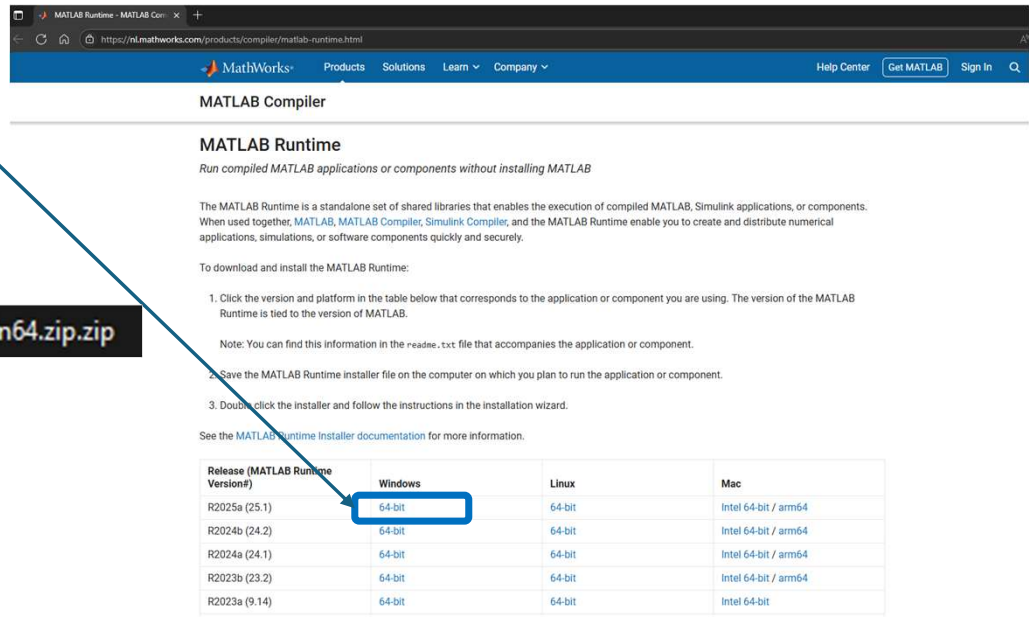
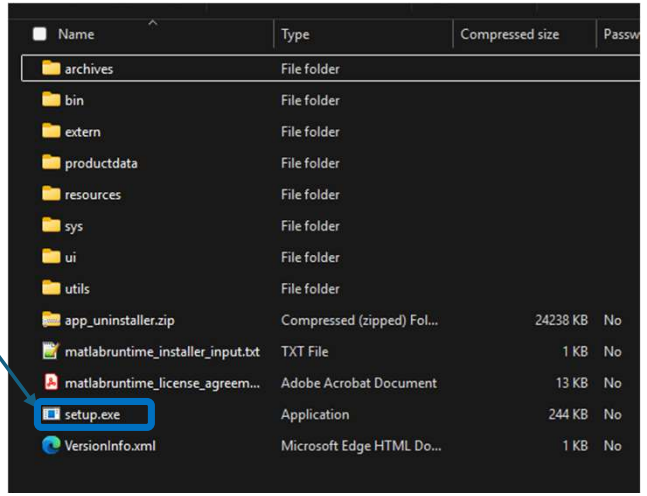
Before the start up

- Download the matlab compiler runtime version 25.1 (see the blue box in the image)
  - MATLAB Runtime - MATLAB Compiler – MATLAB
- Unzip the downloaded folder 

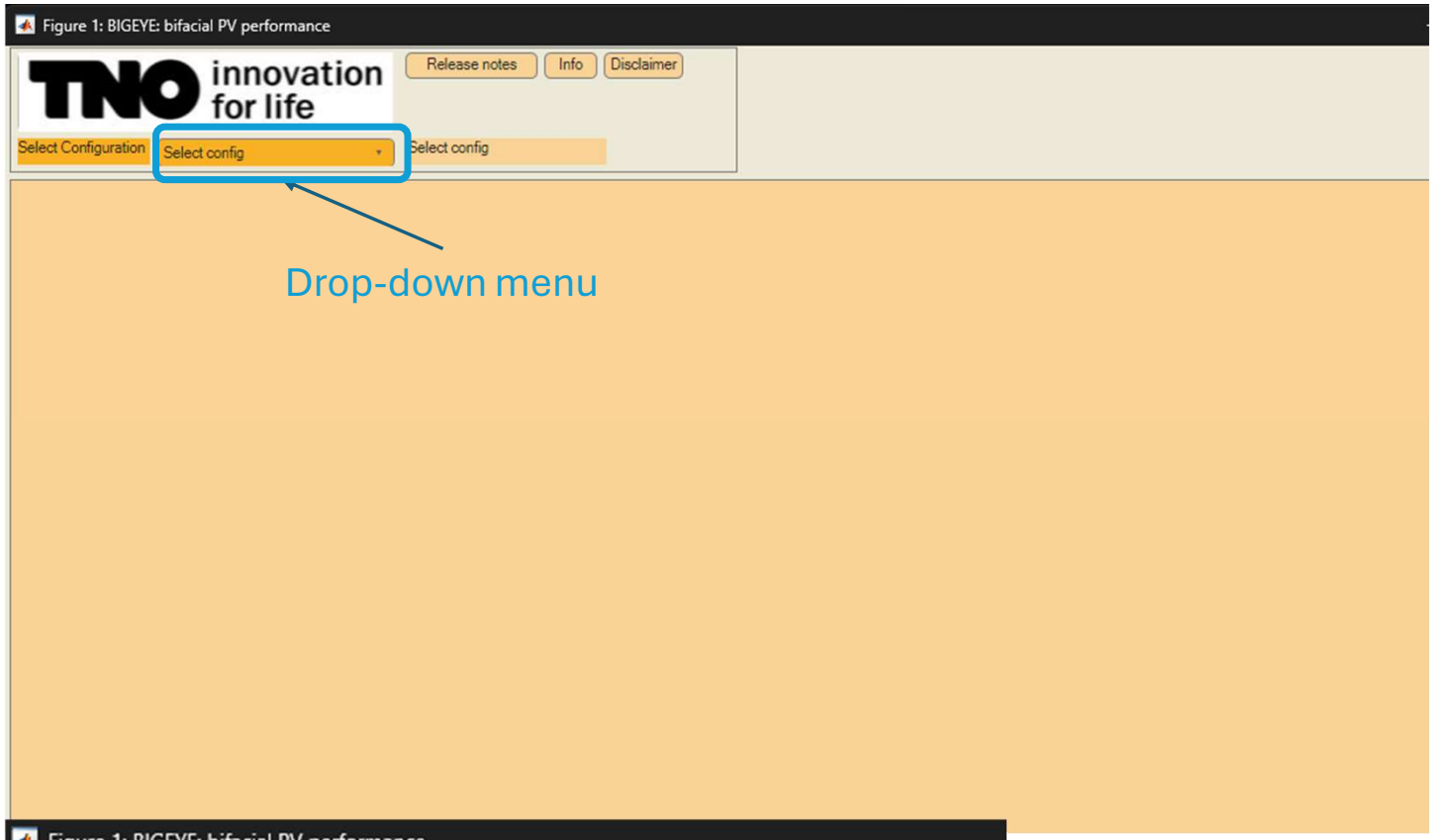
- Install the downloaded matlab compiler runtime version 25.1 by running the file “setup.exe”
- The weather data for the simulation is based on the city of Amsterdam. This is a typical meteorological year with 10-min time stamps.
- The albedo is set as 20%.
- To use a different city or time-period or different albedo please contact bigeye_team@tno.nl



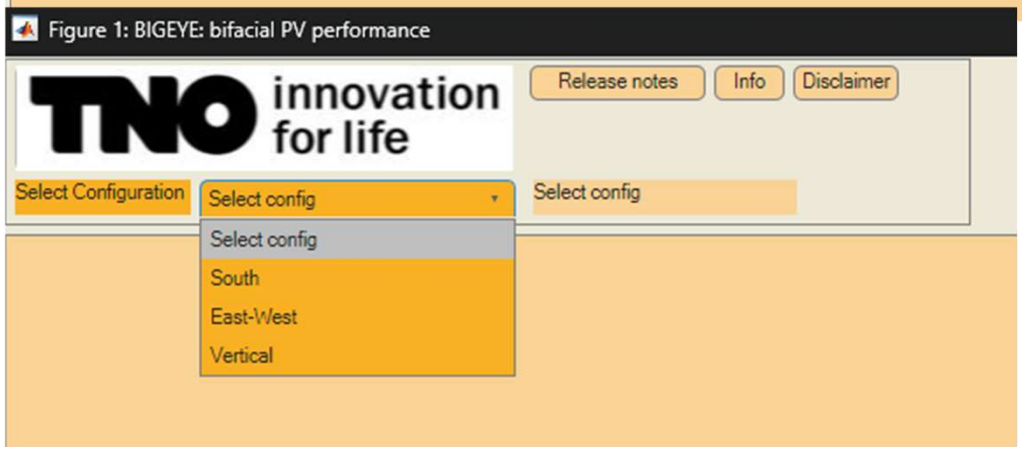


Start up

- The software will open in maximised mode as seen in the image.
- The startup takes a couple of minutes depending on the system resources.



- Currently there are three different configuration available in the drop-down menu, namely,
  - South
  - East-West
  - Vertical
- In the next pages we will look into the different configurations.

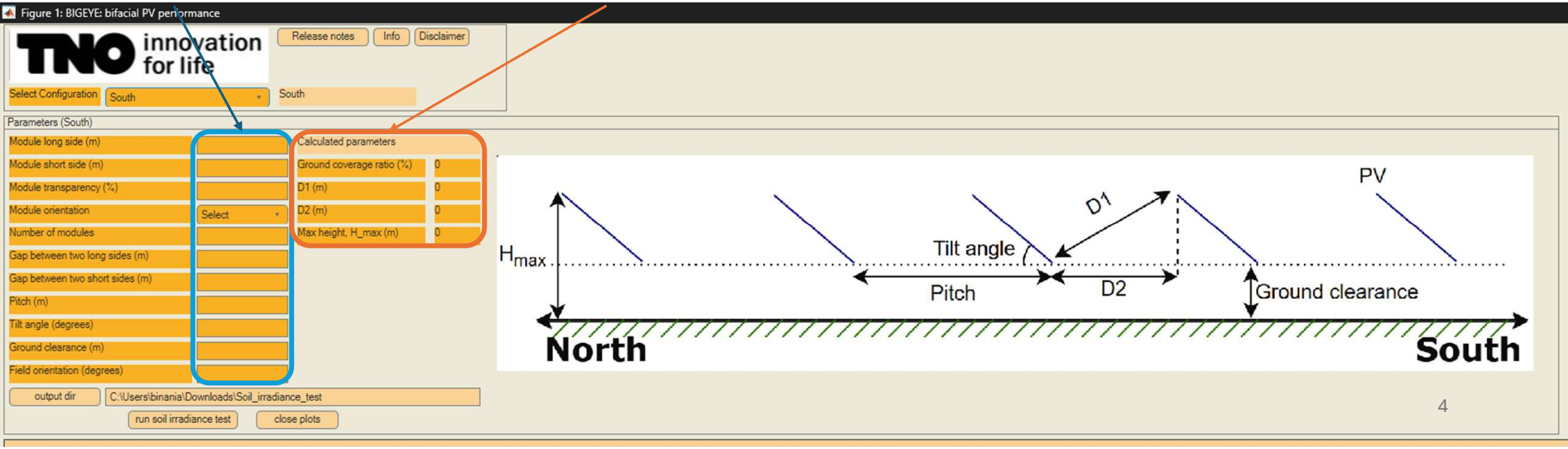


Select Configuration (South)

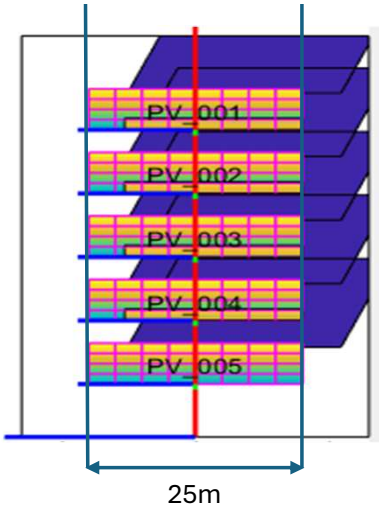
- The parameters panel for the “South configuration” appear on its selection.
- The left panel are the ones to be filled as per the solar park design. **(Fill every parameter for each configuration even if the default value is required)**
- The parameters under the “Calculated Parameters” are for checking the input parameters.
- The static image on the right shows a lateral view of the selected configuration with the visual definition of the parameters.
- The “output dir” button allows one to save the result pdf in a specific location.

Parameters to be filled

Checking parameters



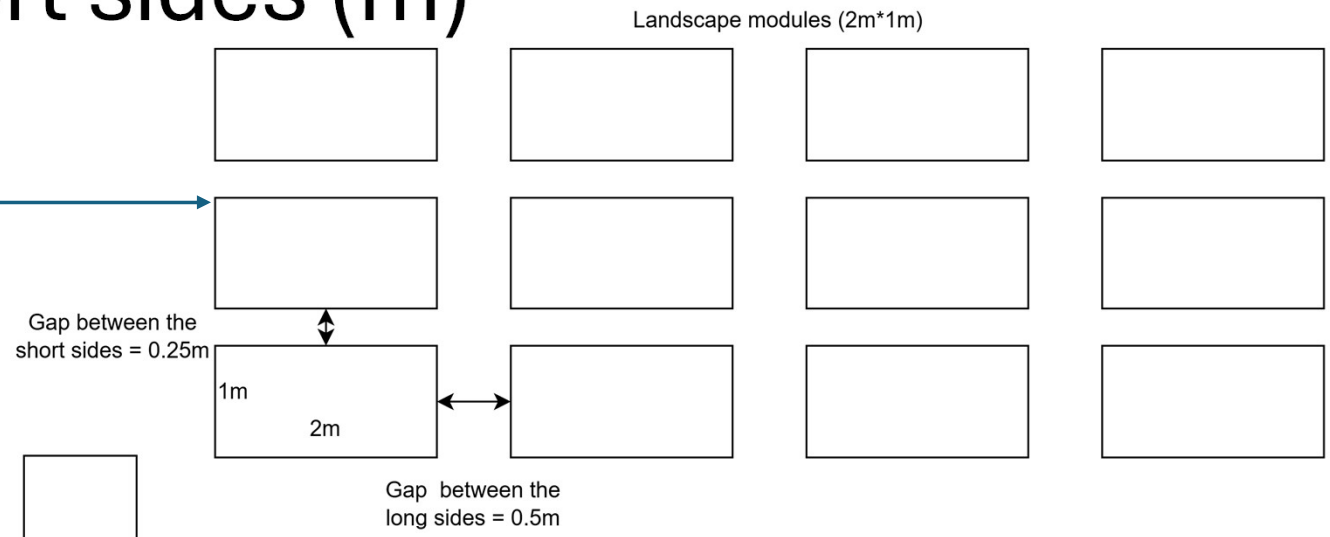
Details about the input parameters (South)



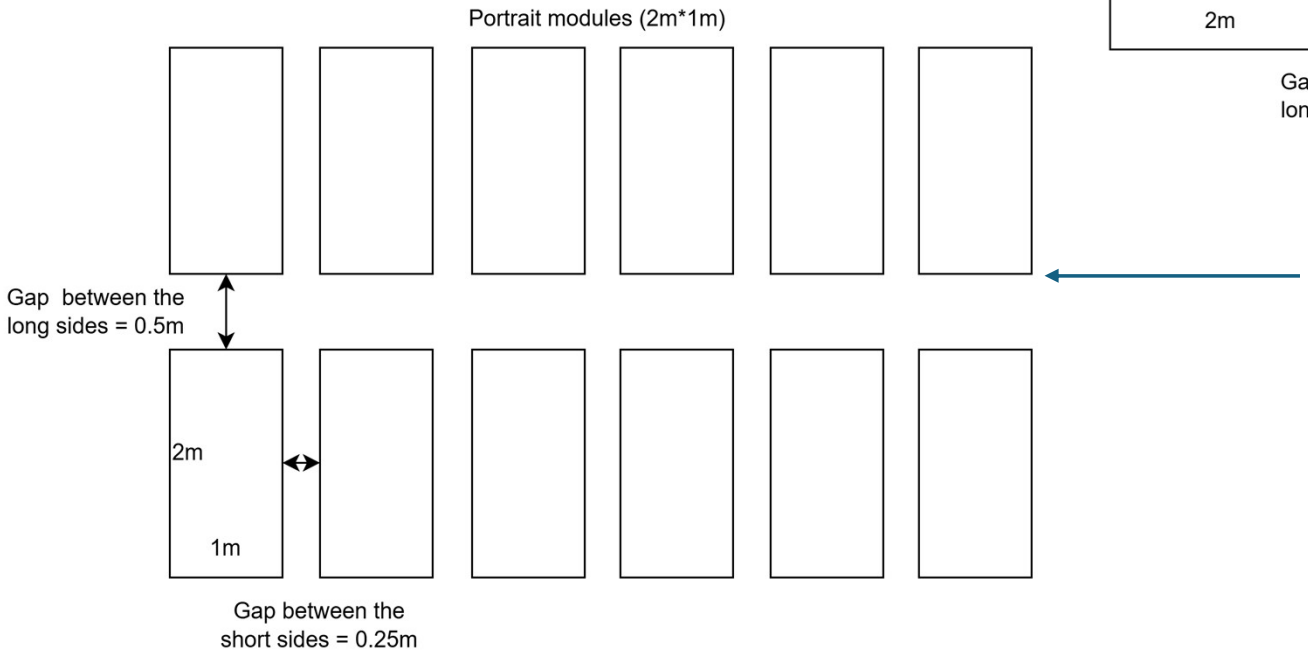
- Module long side (m) – The long side of the module in meters.
- Module short side (m) – The short side of the module in meters.
- Module transparency (%) – The transparency of the module in percentage. The allowed values are from 0 – 80 [0 for fully opaque modules ; 100 for only glass]
- Module orientation – The drop-down menu has two option;1> Landscape, and 2> Portrait.
- Number of modules – This is the number of module in the North-South direction. (For the other direction the PV shed is limited to 25m as seen in the image)
- Gap between two long sides (m) – This is the gap in meters between the two long sides of a PV table. (See the page 6 for visual explanation)
- Gap between two short sides (m) – This is the gap in meters between the two short sides of a PV table. (See the page 6 for visual explanation)
- Pitch (m) – The distance between the base of one PV shed to the base of the next PV shed. If the Pitch is not mentioned in the CAD file then see page 7 for its calculation and double check the D1 and D2 values in the GUI under "Calculated parameters".
- Tilt angle (degrees) – The tilt angle of the module.
- Ground clearance (m) – The distance between the ground and the lower end of the PV shed.
- Field orientation (degrees) – The deviation of the PV park ground alignment with the North-South direction. It can range from -40° to +40° . In the next page we will see the effect of field orientation.

Gap between the long sides (m) &
Gap between the short sides (m)

3L Design



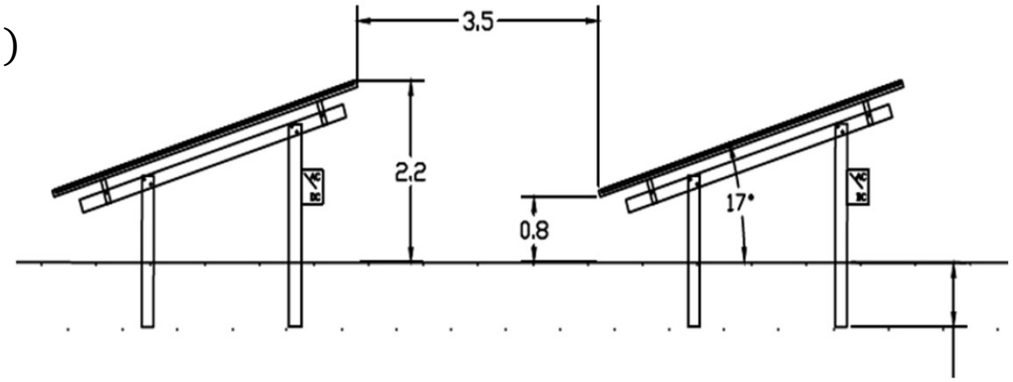
2P Design



Calculation from D2 values to Pitch

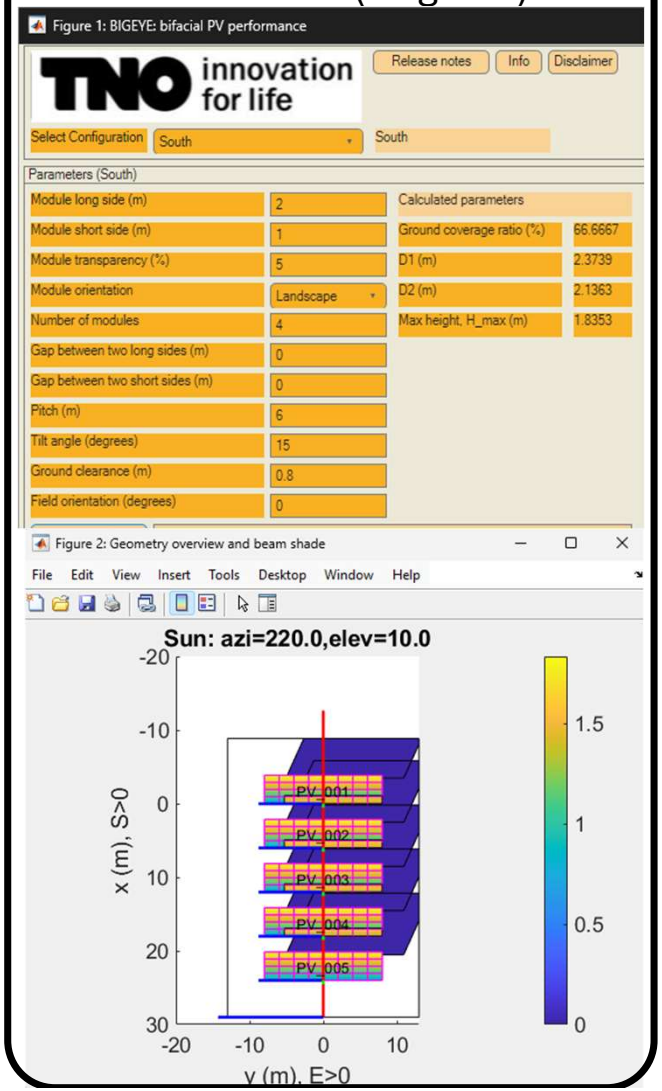
$$\text{Pitch} = \text{D2} + ((\text{Max height} - \text{Min height})/\tan(\text{Tilt angle}))$$

In this example:
Pitch = 3.5 + ((2.2 – 0.8)/tan(17))

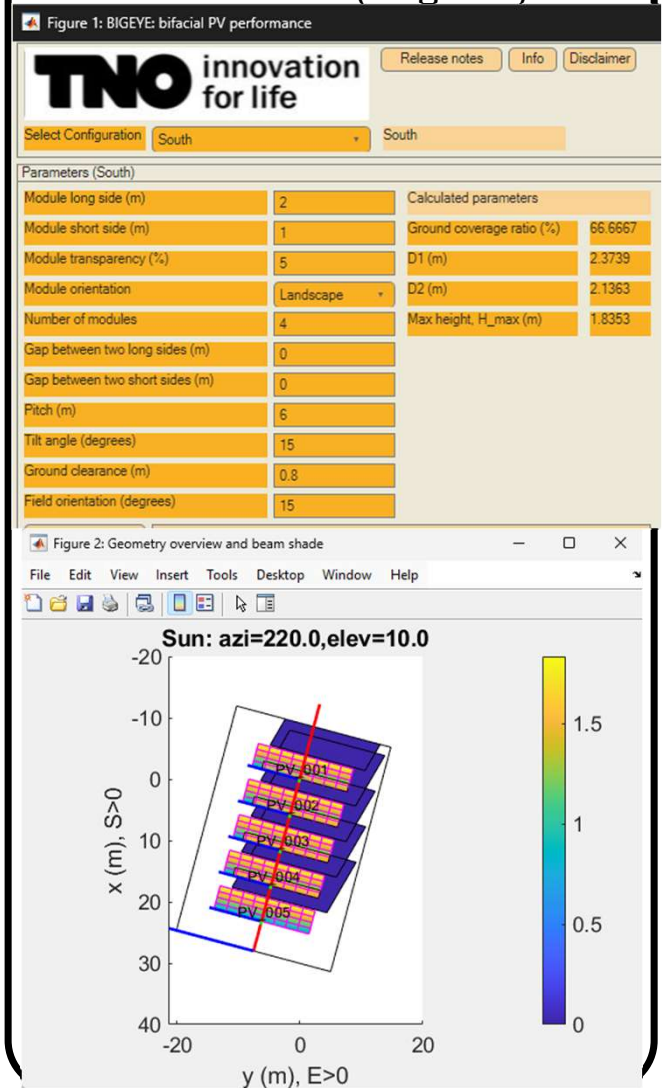


Field orientation for sample input for South configuration

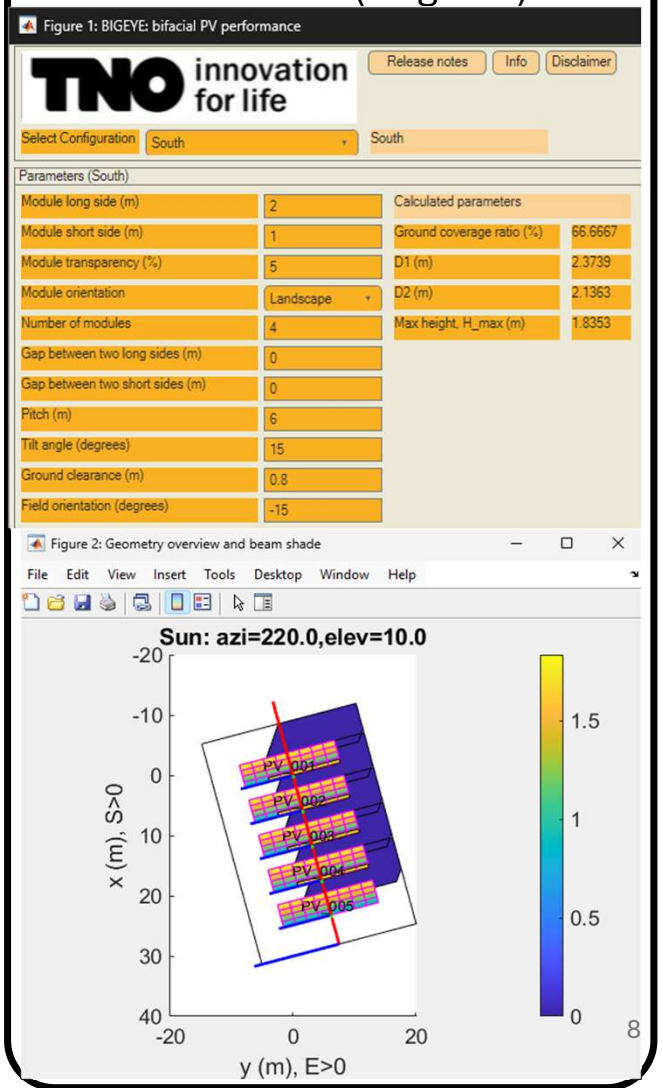
Field Orientation (Degrees) = 0



Field Orientation (Degrees) = 15



Field Orientation (Degrees) = -15

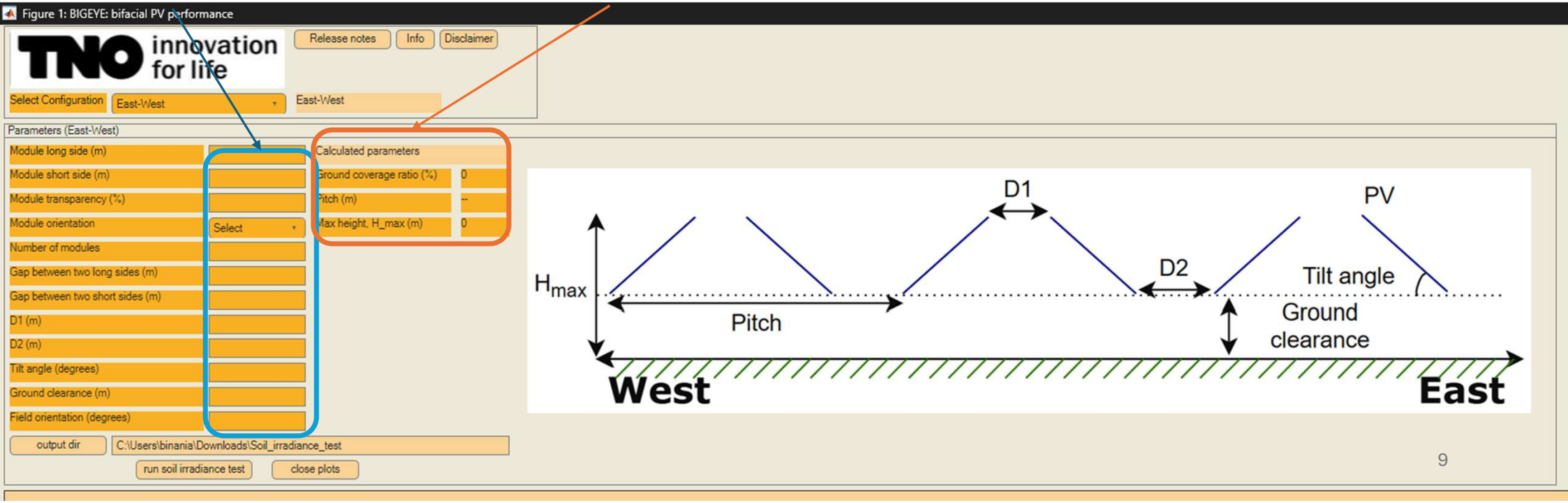


Select Configuration (East-West)

- The parameters panel for the “East-West configuration” appear on its selection.
- The left panel are the ones to be filled as per the solar park design.
- The parameters under the “Calculated Parameters” are for checking the input parameters.
- The static image on the right shows a lateral view of the selected configuration with the visual definition of the parameters.
- The “output dir” button allows one to save the result pdf in a specific location.

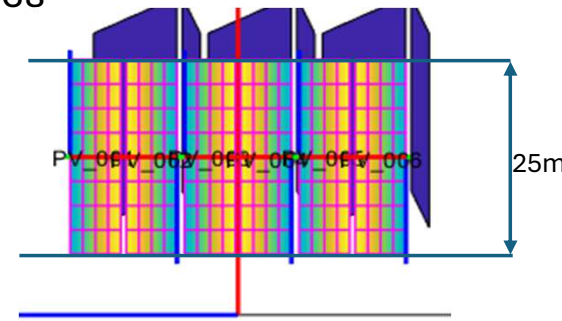
Parameters to be filled

Checking parameters



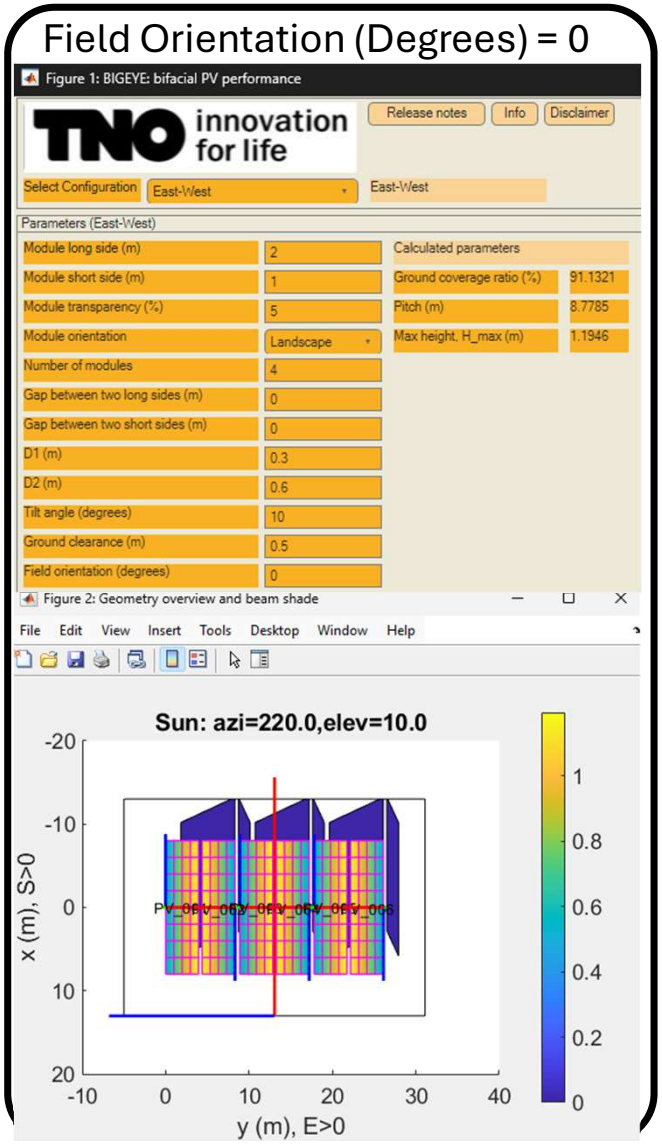
Details about the input parameters (East-West)

- Module long side (m) – The long side of the module in meters.
- Module short side (m) – The short side of the module in meters.
- Module transparency (%) – The transparency of the module in percentage. The allowed values are from 0 – 80 [0 for fully opaque modules ; 100 for only glass]
- Module orientation – The drop-down menu has two option;1> Landscape, and 2> Portrait.
- Number of modules – This is the number of module in the East-West direction. (For the other direction the PV shed is limited to 25m as seen in the image)
- Gap between two long sides (m) – This is the gap in meters between the two long sides of a PV table.
- Gap between two short sides (m) – This is the gap in meters between the two short sides of a PV table.
- D1 (m) – The distance between the top gap of the adjacent PV sheds.
- D2 (m) – The distance between the bottom gap of the adjacent PV sheds.
- Tilt angle (degrees) – The tilt angle of the module.
- Ground clearance (m) – The distance between the ground and the lower end of the PV shed.
- Field orientation (degrees) – The deviation of the PV park ground alignment with the North-South direction. It can range from -40° to +40°. In the next page we will see the effect of field orientation.

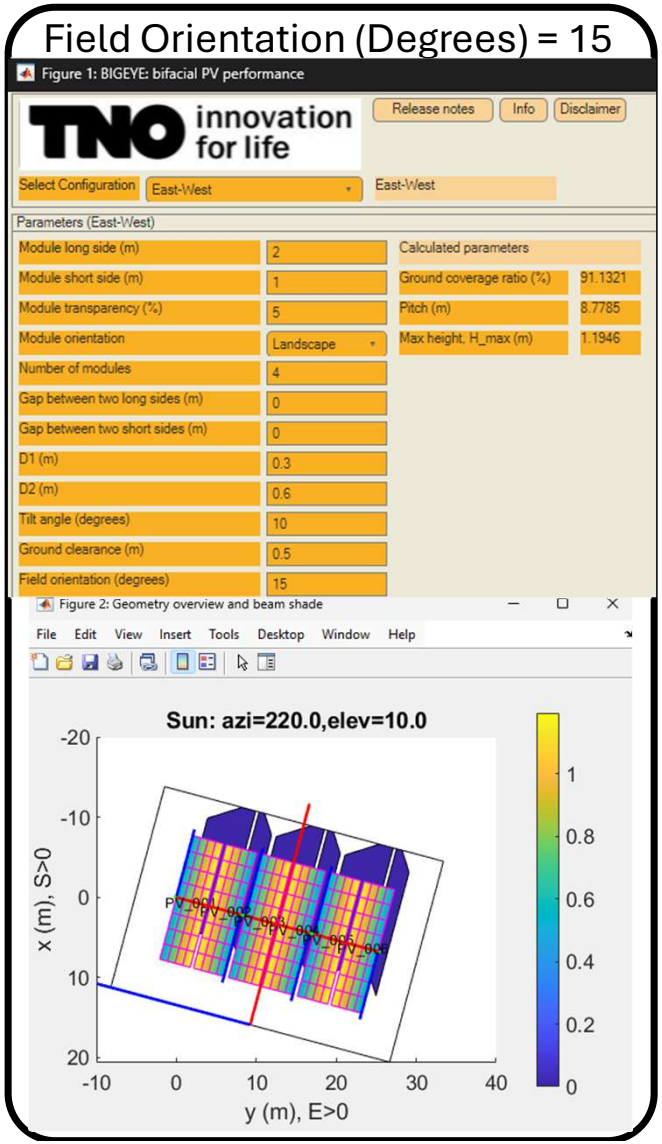


Field orientation for sample input for East-West configuration

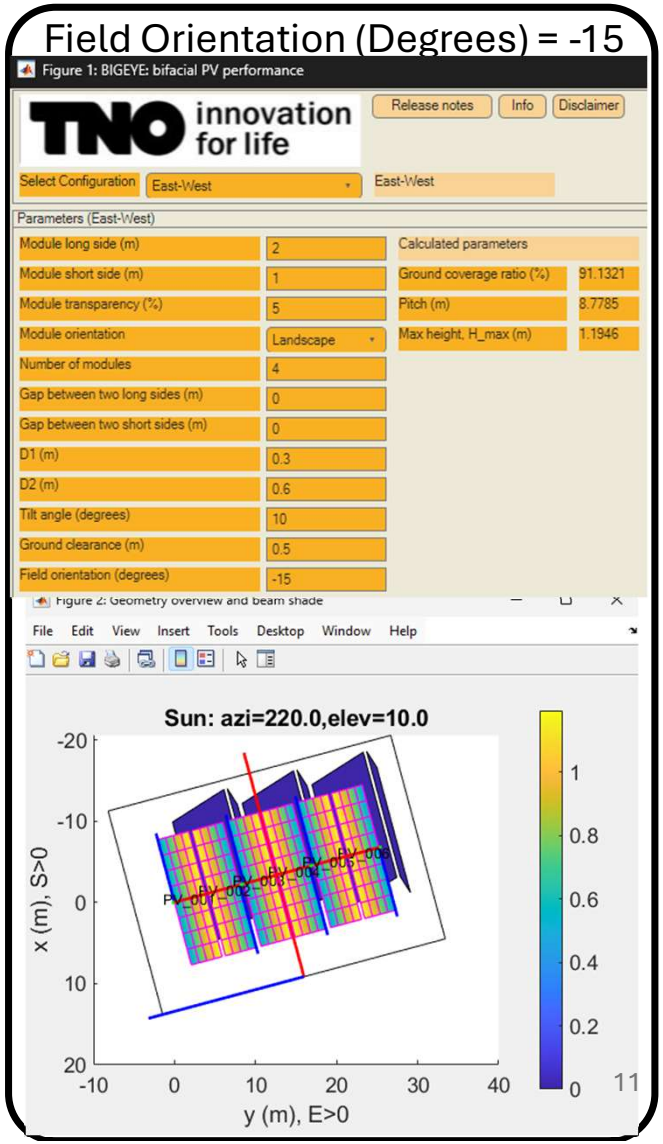
Field Orientation (Degrees) = 0



Field Orientation (Degrees) = 15



Field Orientation (Degrees) = -15

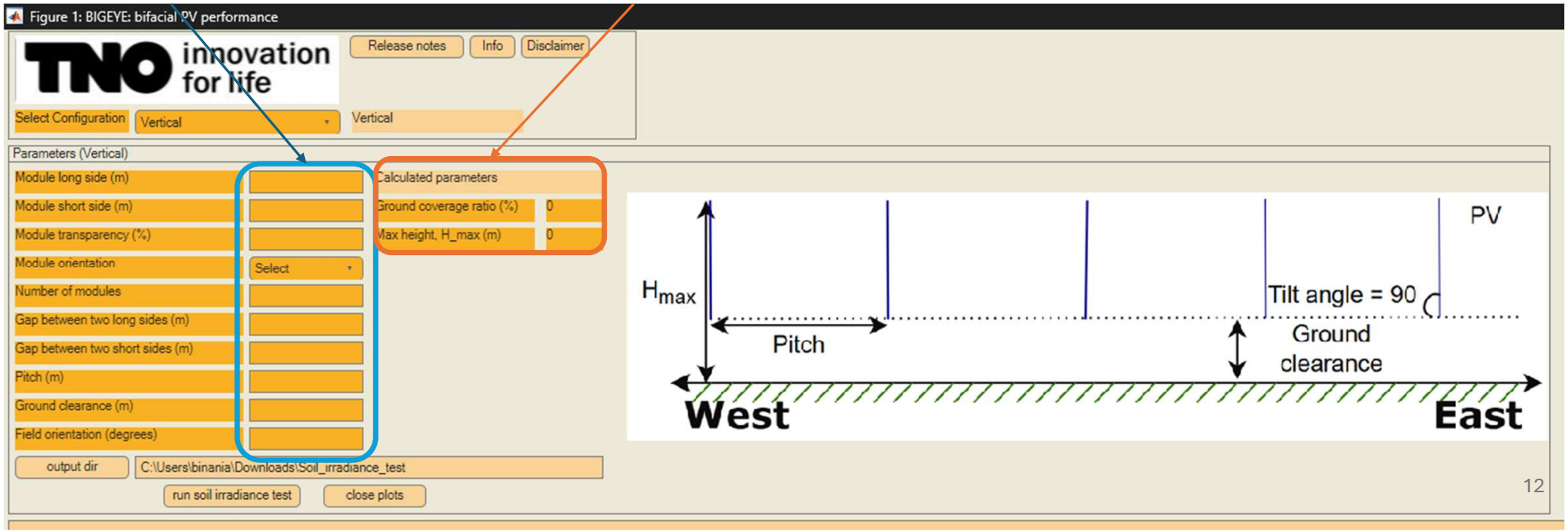


Select Configuration (Vertical)

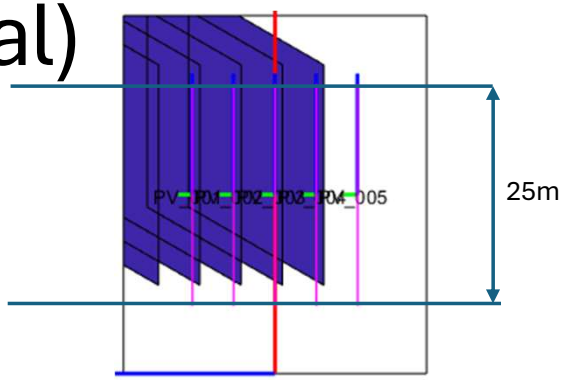
- The parameters panel for the “Vertical configuration” appear on its selection.
- The left panel are the ones to be filled as per the solar park design.
- The parameters under the “Calculated Parameters” are for checking the input parameters.
- The static image on the right shows a lateral view of the selected configuration with the visual definition of the parameters.
- The “output dir” button allows one to save the result pdf in a specific location.

Parameters to be filled

Checking parameters



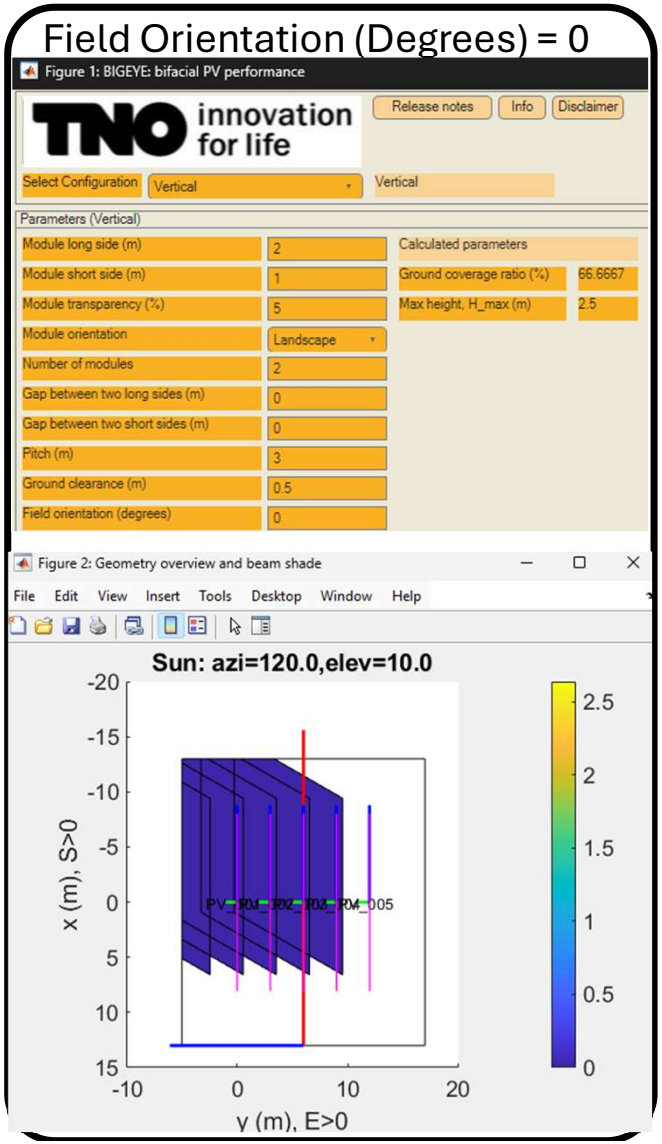
Details about the input parameters (Vertical)



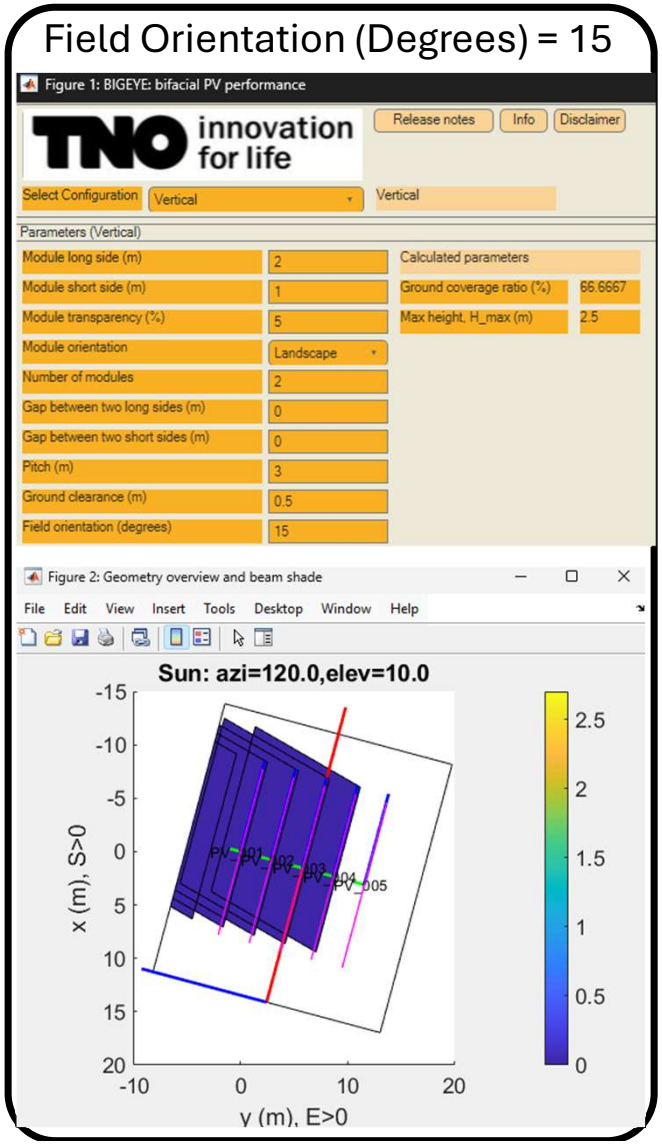
- Module Length (m) – The long side of the module in meters.
- Module Width (m) – The short side of the module in meters.
- Module Transparency (%) – The transparency of the module in percentage. The allowed values are from 0 – 80 [0 for fully opaque modules ; 100 for only glass]
- Module Orientation – The drop-down menu has two option;1> Landscape, and 2> Portrait.
- Number of modules – This is the number of module in the Vertical direction. (For the other direction the PV shed is limited to 25m as seen in the image)
- Gap between two long sides (m) – This is the gap in meters between the two long sides of a PV table.
- Gap between two short sides (m) – This is the gap in meters between the two short sides of a PV table.
- Pitch (m) – The distance between the base of one PV shed to the base of the next PV shed.
- Tilt Angle (Degrees) – The tilt angle of the module.
- Ground Clearance (m) – The distance between the ground and the lower end of the PV shed.
- Field Orientation (Degrees) – The deviation of the PV park ground alignment with the North-South direction. It can range from -40° to +40°. In the next page we will see the effect of field orientation.

Field orientation for sample input for Vertical configuration

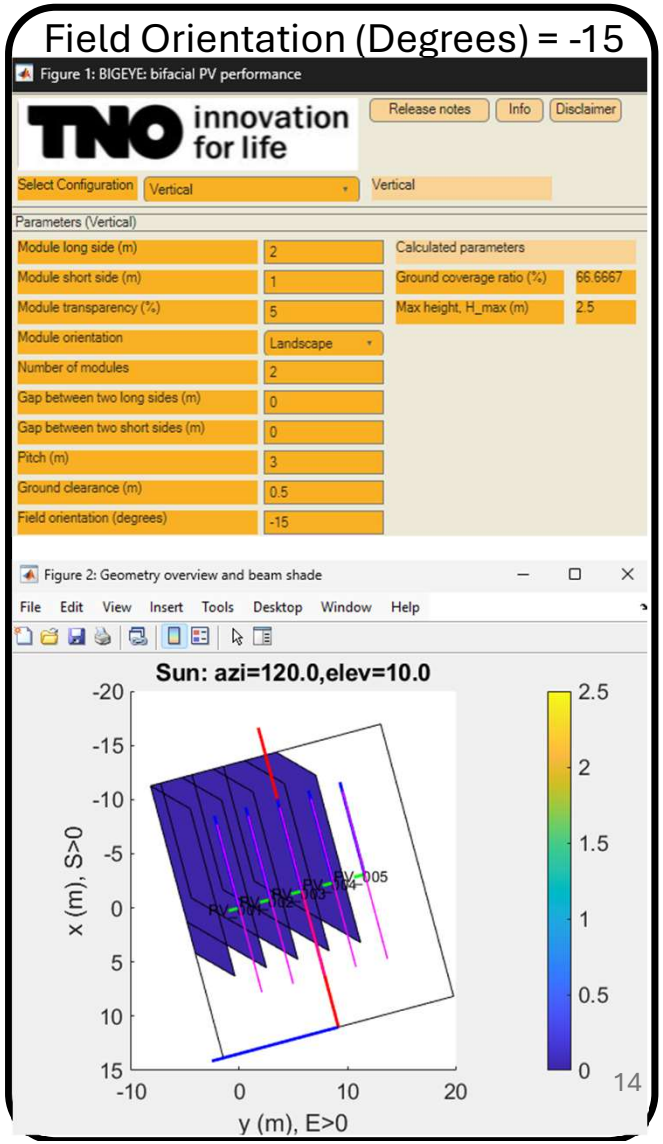
Field Orientation (Degrees) = 0



Field Orientation (Degrees) = 15



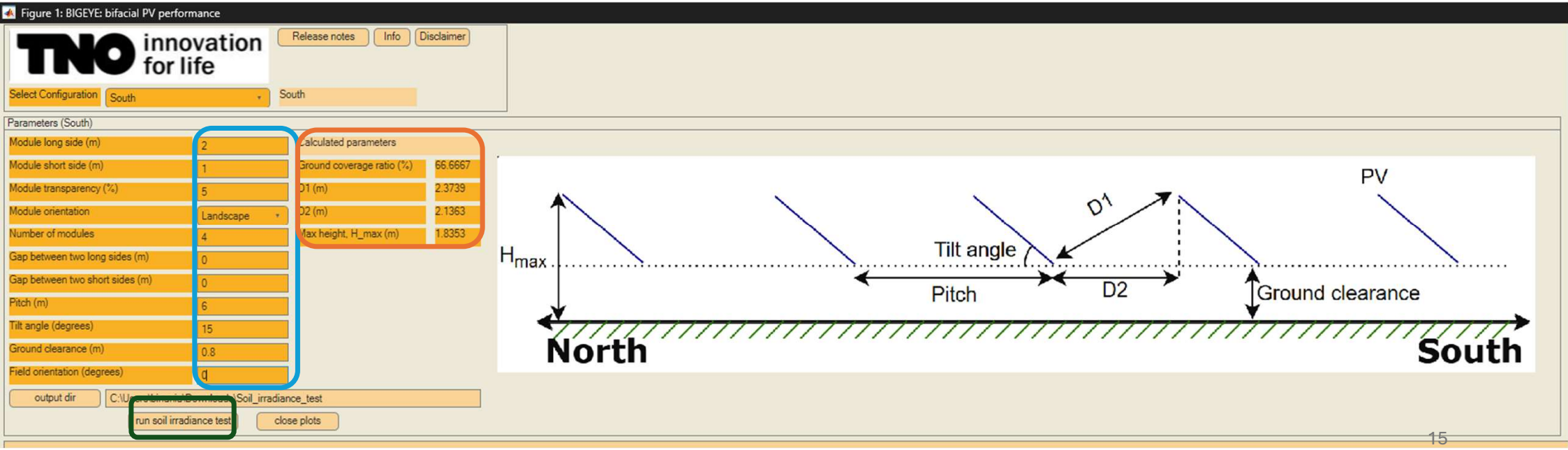
Field Orientation (Degrees) = -15



Test run for South configuration

Steps:

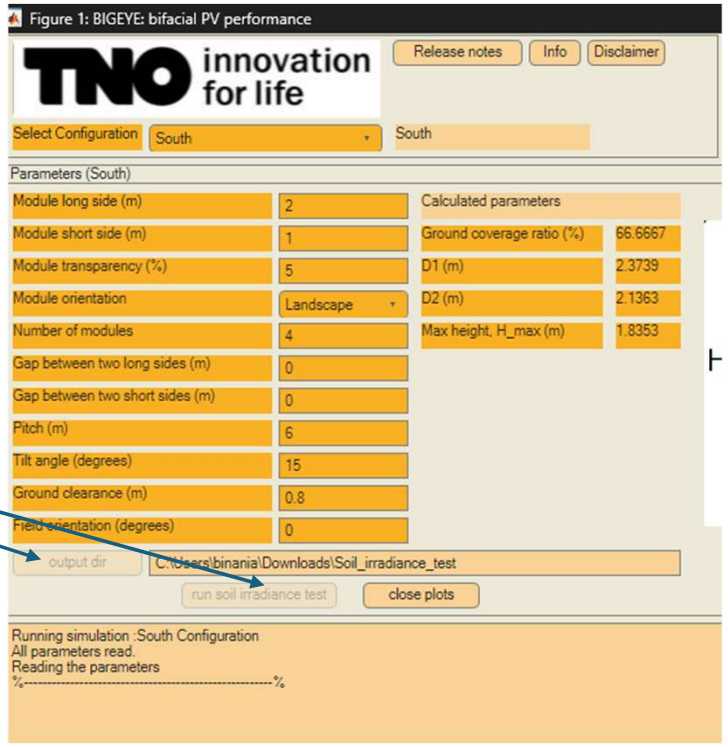
1. Input all the parameters in the blue box.
   a. Check the parameters in the orange box.
   b. Select the “output dir” to save the pdf.
2. Click on the “run soil test” button (Dark green box) to start the simulation.
3. The “close plots” button will close all the plots that appear after the simulation is completed.



Test run for South configuration (Contd.)

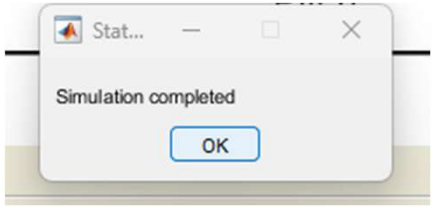
Simulation in progress:

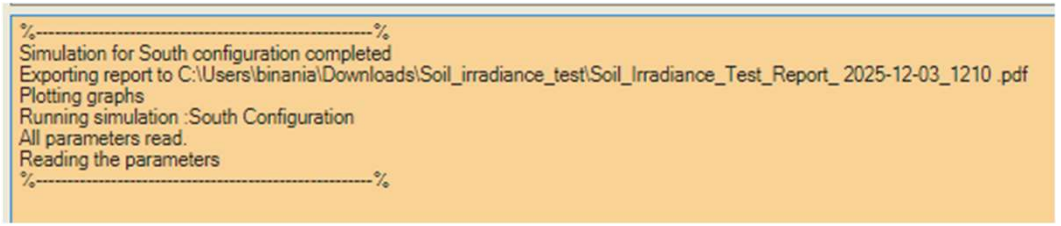
1. The “output dir” and “run soil test” buttons will be greyed out during the runtime.
2. A log is also displayed in the bottom. It reads bottom up.



Simulation completed:

1. There will be three pop-up windows with the three different figures/plots.
2. Once the simulation is completed a pop-up window will indicate that the simulation is completed. Clicking on the “OK” will restore the “output dir” and “run soil test” buttons.

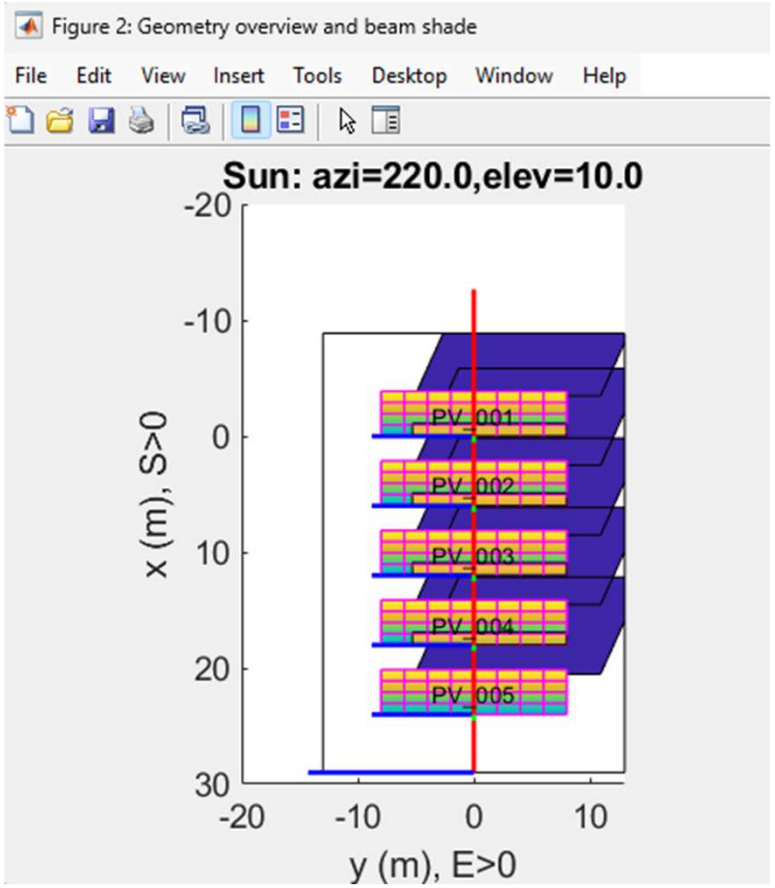




Test run for South configuration (Contd.)

First figure/plot:

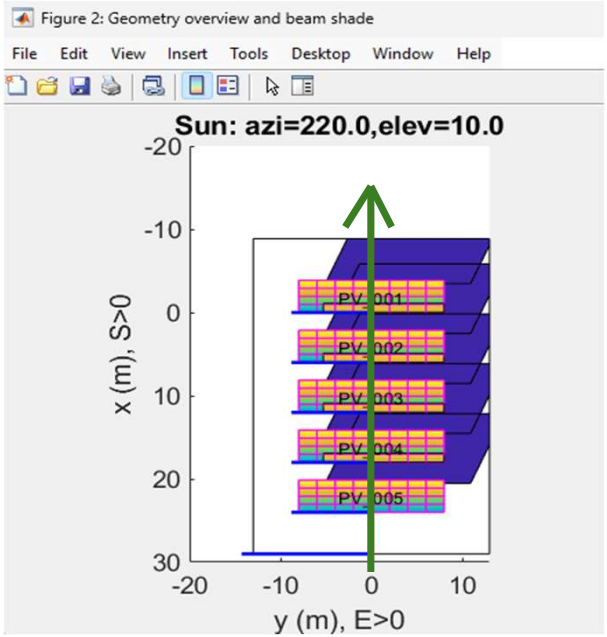
1. The first plot is the top-down view of the PV system.
2. The Sun's position is fixed at azimuth of 220 and elevation of 10 which cast the shows on the ground as seen in dark blue.
3. The scale bar on the right indicates the height of different PV modules with respect to ground.
4. In this case the system is aligned with the North-South direction.

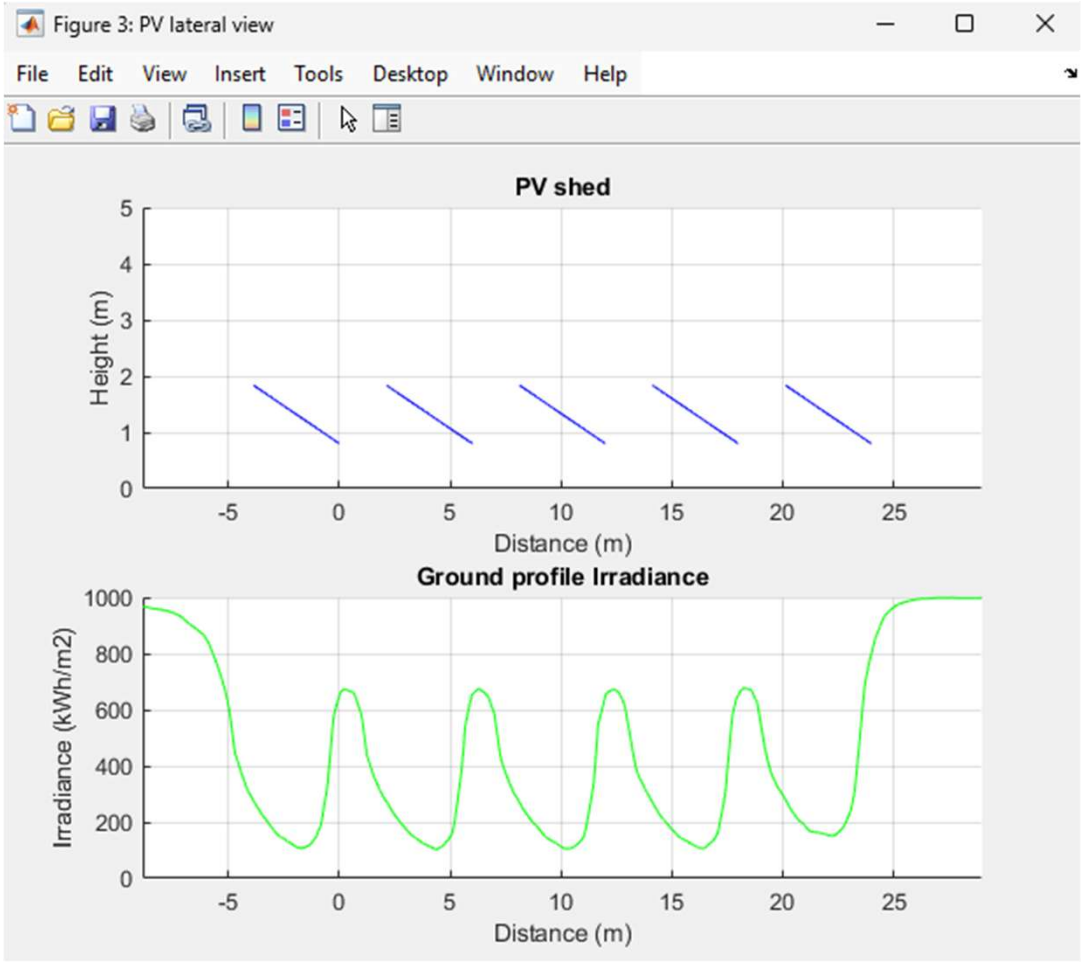


Test run for South configuration (Contd.)

Second figure/plot:

1. The second figure consists of two plots.
2. The top plot is the lateral view of the PV sheds.
3. The bottom plot is the sum of the irradiance falling on the ground profile (as indicated in “Figure 2 : Geometry overview and beam shade ”by the green line).

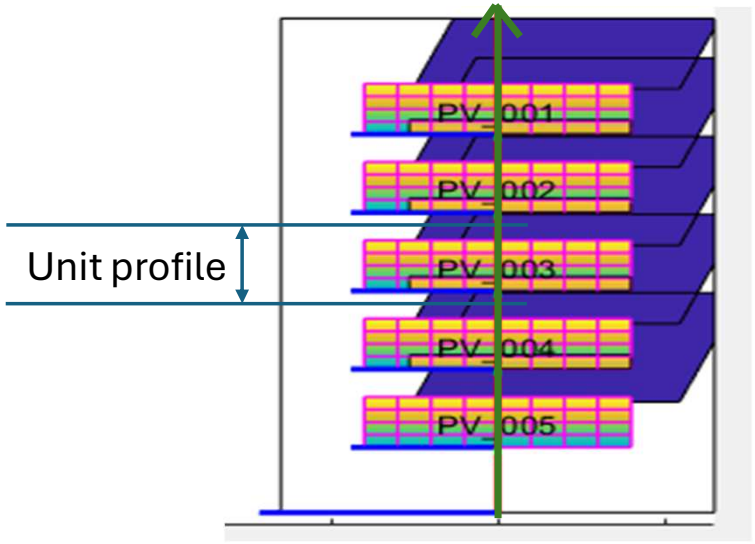


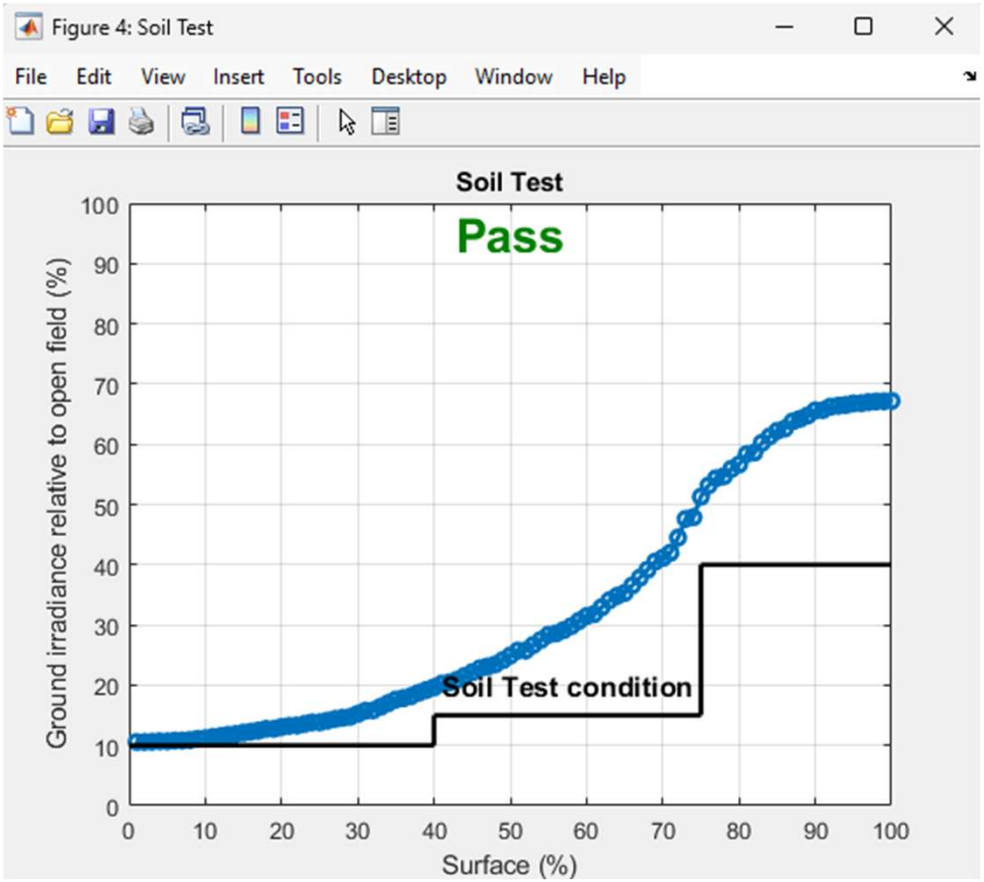


Test run for South configuration (Contd.)

Third figure/plot:

1. This plot is the soil test result.
2. The Text in the graph area indicates whether the design is a “**PASS**” or “**Fail**” .
3. The bold black lines in the form of steps are the soil test conditions.
4. The blue line with marker is the ground irradiance on the Unit profile of the design.

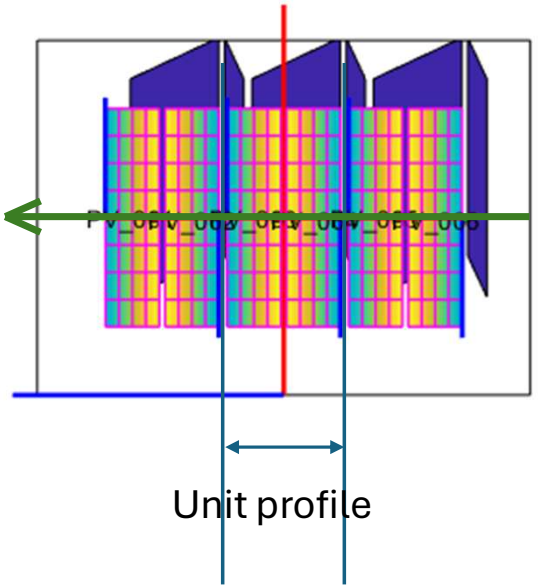


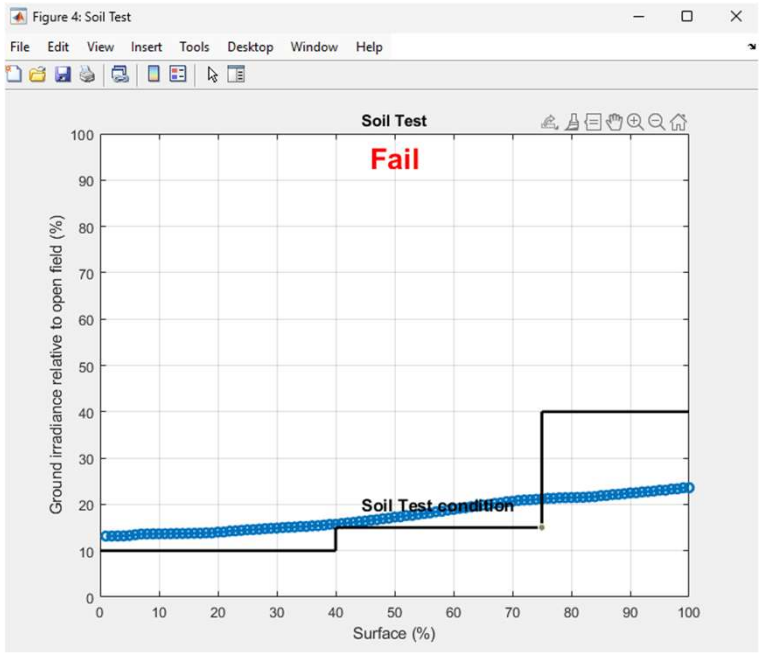


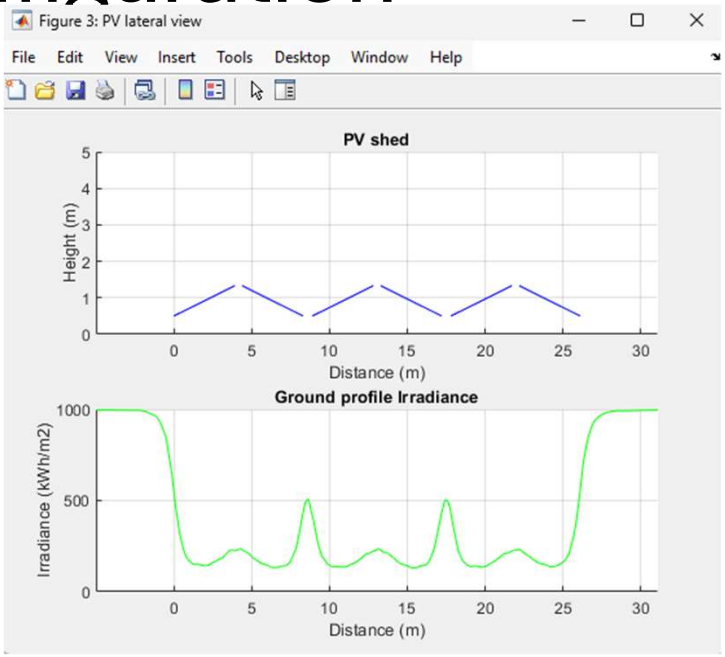
Soil Test result for East-West configuration

Third figure/plot:

1. This plot is the soil test result.
2. The Text in the graph area indicates whether the design is a “**PASS**” or “**Fail**” .
3. The bold black lines in the form of steps are the soil test conditions.
4. The blue line with marker is the ground irradiance on the Unit profile of the design.



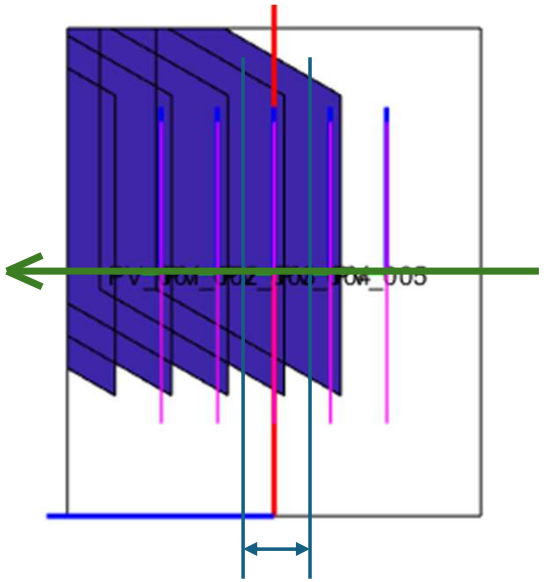




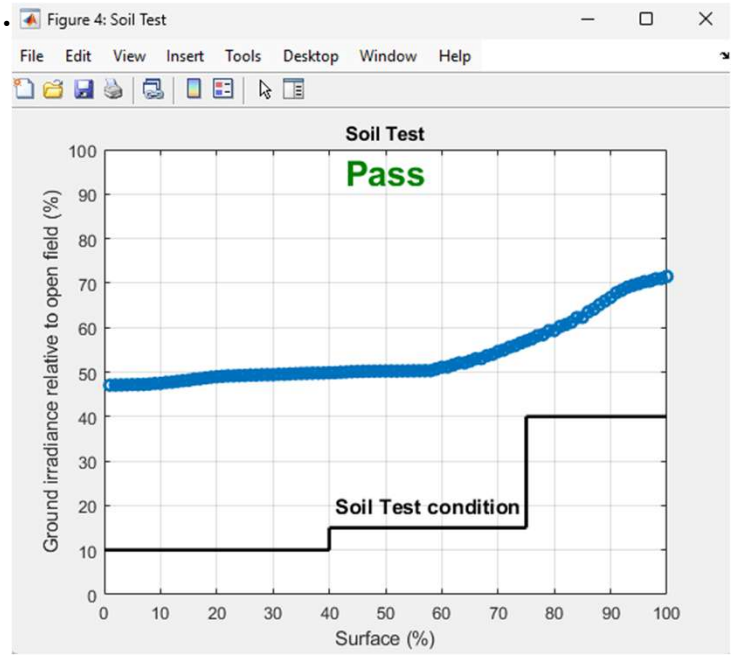
Soil Test result for Vertical configuration

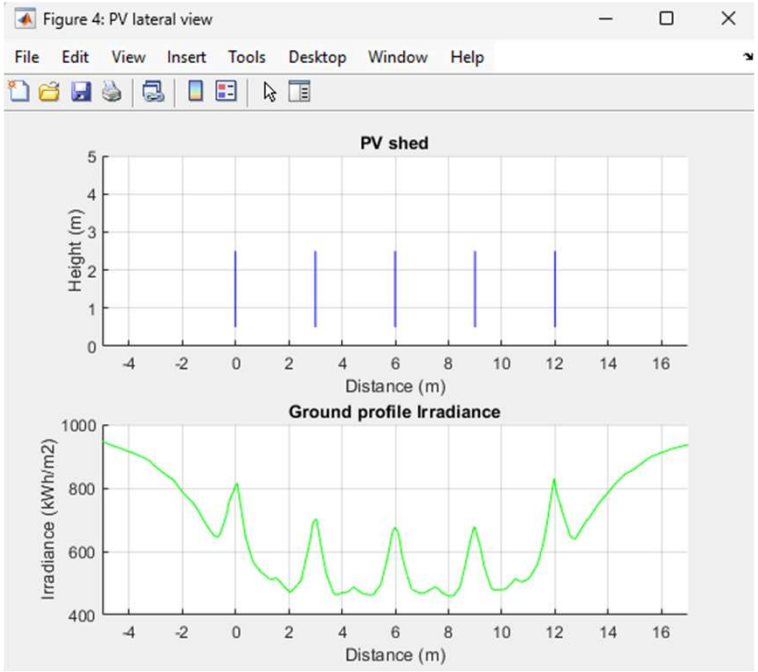
Third figure/plot:

1. This plot is the soil test result.
2. The Text in the graph area indicates whether the design is a “**PASS**” or “**Fail**” .
3. The bold black lines in the form of steps are the soil test conditions.
4. The blue line with marker is the ground irradiance on the Unit profile of the design.



Unit profile





For more detailed information on Soil Test calculation please refer to the publication:

Evaluation method and module design for cost-effective compliance with irradiance guidelines to maintain soil quality in solar parks.
-Ilkay Cesar and Bas B. Van Aken
https://doi.org/10.1051/epjpv/2025003