

Here are the examples of Tandem performance calculator.

## Tandem Performance Calculator (Python)

Calculate 4T  
Tandem

Call a function:

```
def calc_tandem_4T_eff
```

Inside the function (**A summary of events**):

- Reading provided calculated SE files of top and bottom cells
- Define the optical coupling methods
  - ideal coupling
  - fixed coupling
  - lambda coupling
- SE for top and bottom cells in a 4T tandem combination is determined using coupling methods
- Based on 4T tandem SE, calculated power and efficiency from each sub-cell
- Calculate the efficiency of a 2T tandem based on SE
- QE is determined utilizing coupling methods for top and bottom cells in a 4T tandem configuration
- Calculate the 4T tandem efficiency using J-V of sub-cells and the determined Jsc from QE in a 4T tandem combination
- Plotting and saving input data and output results

Please use the following link to download the Spectral Efficiency (SE) and Tandem Performance calculators: <https://github.nrel.gov/Tandems/SE-and-Tandems> . Please read the readme file carefully for detailed instructions on how to download and use it.

To run the SE and Tandem Performance calculators successfully, please install the iv\_param using **pip install iv-params** in the same directory as the downloaded SE and Tandem Performance calculators file, and for additional information, refer to the following link: [https://github.com/NREL/iv\\_params#readme](https://github.com/NREL/iv_params#readme)

Short Guidance: Users can upload input files (calculated SE files) from anywhere on their computer into the Tandem Performance GUI, however the calculated SE files from the SE calculator are saved in the calculatedSE folder. When computing 4T or 2T tandem efficiency, the user should choose one of three coupling methods. For better understanding, please see three more examples of coupling method in this Examples folder. The calculated tandem efficiency files and the image will be saved in the tandems\_data and tandems\_image folders, respectively. For complete instructions on installing and using the Tandem Performance calculator, please read the readme file.

### Layout of the Tandem Performance calculator

The screenshot displays the user interface of the Tandem Performance calculator, organized into three sequential steps:

- Step 1: Select cells**
  - Section: **Select Top Cell(s)**
  - Button: **Select Files** (with a folder icon)
  - Area: A large empty rectangular box for file selection.
  - Section: **Select Bottom Cell(s)**
  - Button: **Select Files** (with a folder icon)
  - Area: A large empty rectangular box for file selection.
- Step 2: Select 1 from 3 coupling methods**
  - Section: **Coupling methods:**
  - Dropdown menu: **Use top cell transmission file** (with a downward arrow icon).
  - Slider: **Fixed T %:** with a slider bar and a value of **90**.
  - Button: **Select Transmission File for lambda Coupling** (with a folder icon).
  - Area: A large empty rectangular box for file selection.
- Step 3: Select calculate options**
  - Buttons: **Calculate 4T Tandem**, **Calculate 2T Tandem**, and **Clear Output Results**.

Please see the following page!

## Tandem Performance Calculator (Python)

Calculate 2T  
Tandem

Call a function:

```
def calc_tandem_2T_eff
```

Inside the function (**A summary of events**):

- Reading provided calculated SE files of top and bottom cells
- Define the optical coupling methods
  - ideal coupling
  - fixed coupling
  - lambda coupling
- SE for top and bottom cells in a 2T tandem combination is determined using coupling methods
- Based on 2T tandem SE, calculated power and efficiency from each sub-cell
- Calculate the efficiency of a 2T tandem based on SE
- QE is determined utilizing coupling methods for top and bottom cells in a 2T tandem configuration
- Calculate the 2T tandem efficiency using J-V of sub-cells and the determined Jsc from QE in a 2T tandem combination
- Plotting and saving input data and output results