MSCS-1D user manual

Abu Kowsar

August 17, 2019

apukowsar@gmail.com

Foreword

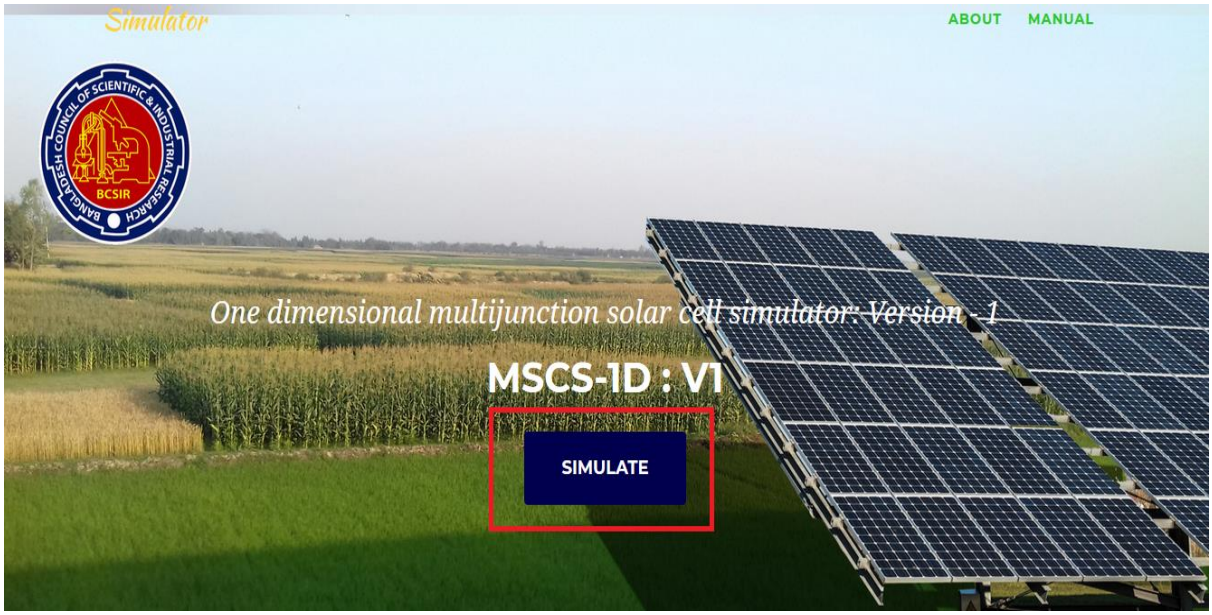
One dimensional multijunction solar cell simulator (MSCS-1D) is developed by Advanced Photovoltaic Lab, Bangladesh Council of Scientific and Industrial Research (BCSIR). This work is financially supported by the Ministry of Science and Technology, the People's Republic of Bangladesh under Special Allocation Project (GRANT NUMBER: 39.00.0000.09.02.18-19/09/458/ID-57 Date: 14.01. 2019). This user manual is a guideline for the users to work with this MSCS-1D simulator. For using this simulator, the user has either to register for securing password in online version or to install the simulation software from the download icon given in the homepage.

Quick user manual of MSCS-1D:

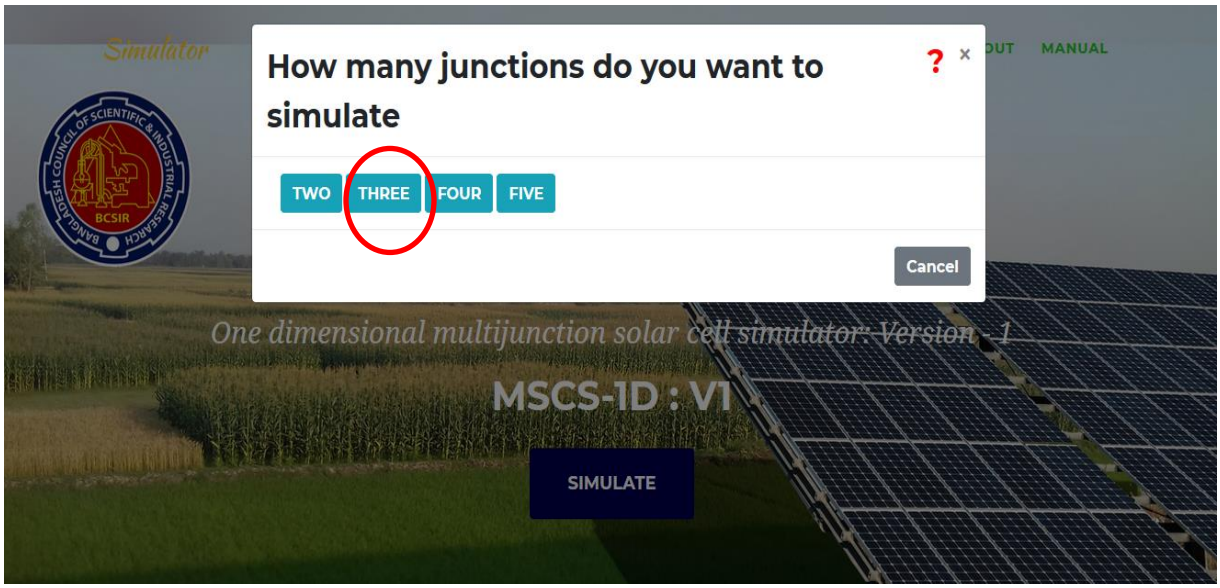
To simulate the efficiency and performance parameters of any multijunction solar cell, the user has to follow the steps bellow.

1. **Select the number of junction**

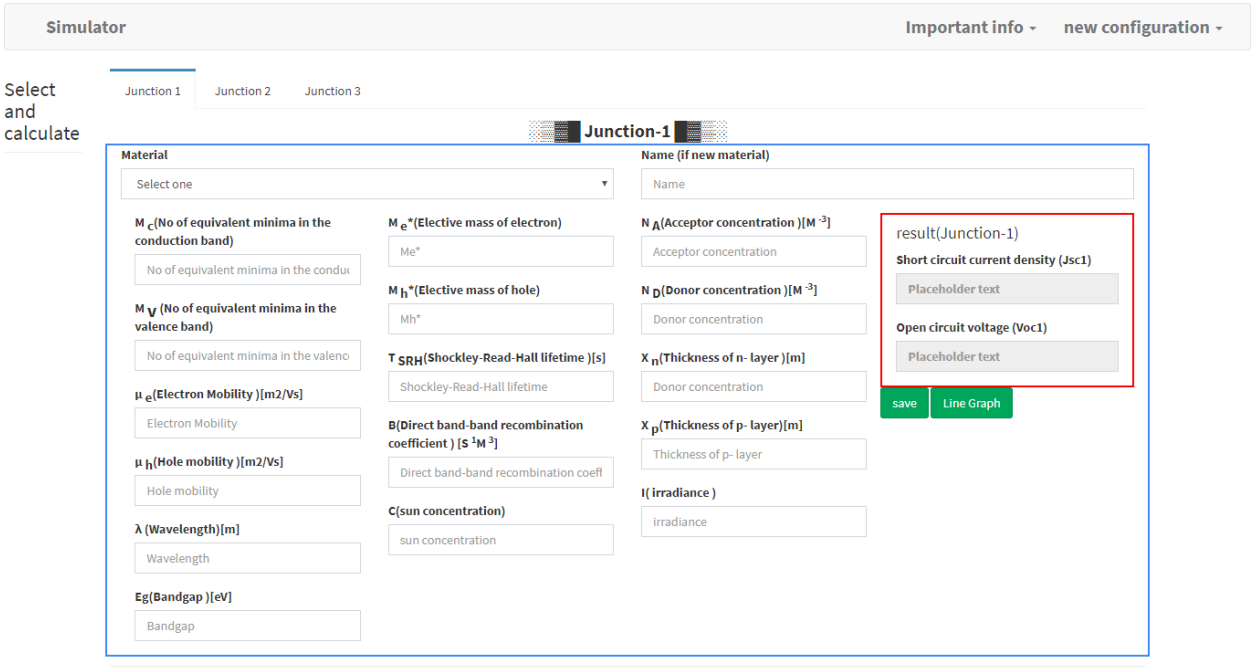
1.1 Click simulate button shown in the outlined by red rectangle on home page.



1.2 The user will find the following pop-up window for selecting the number of junction.

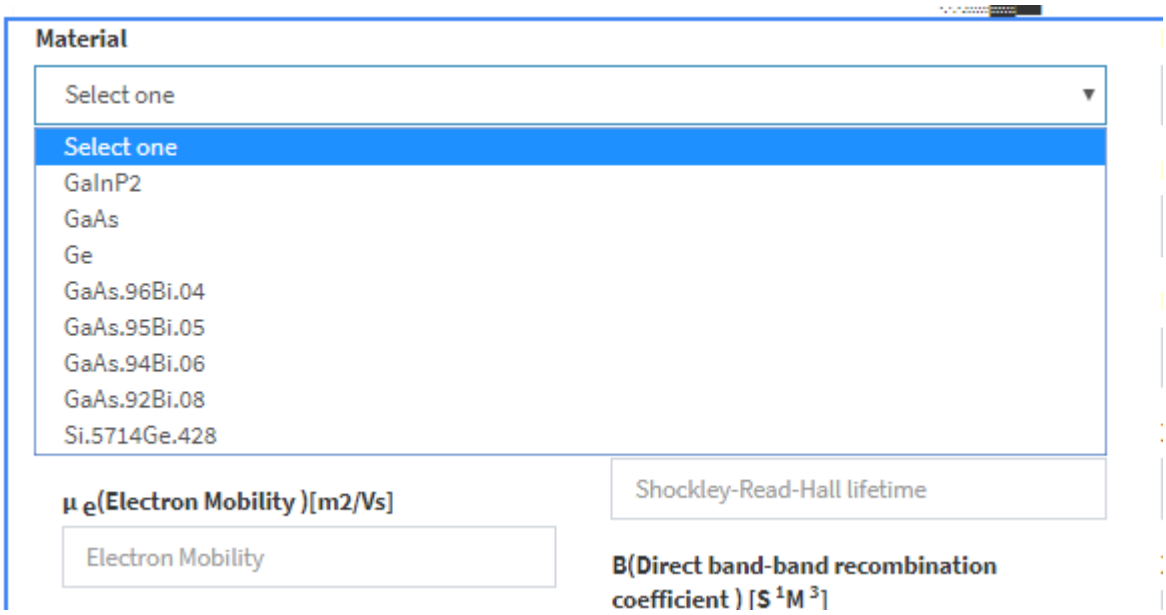


1.3 The following dialog box will appear for selecting the junction number three

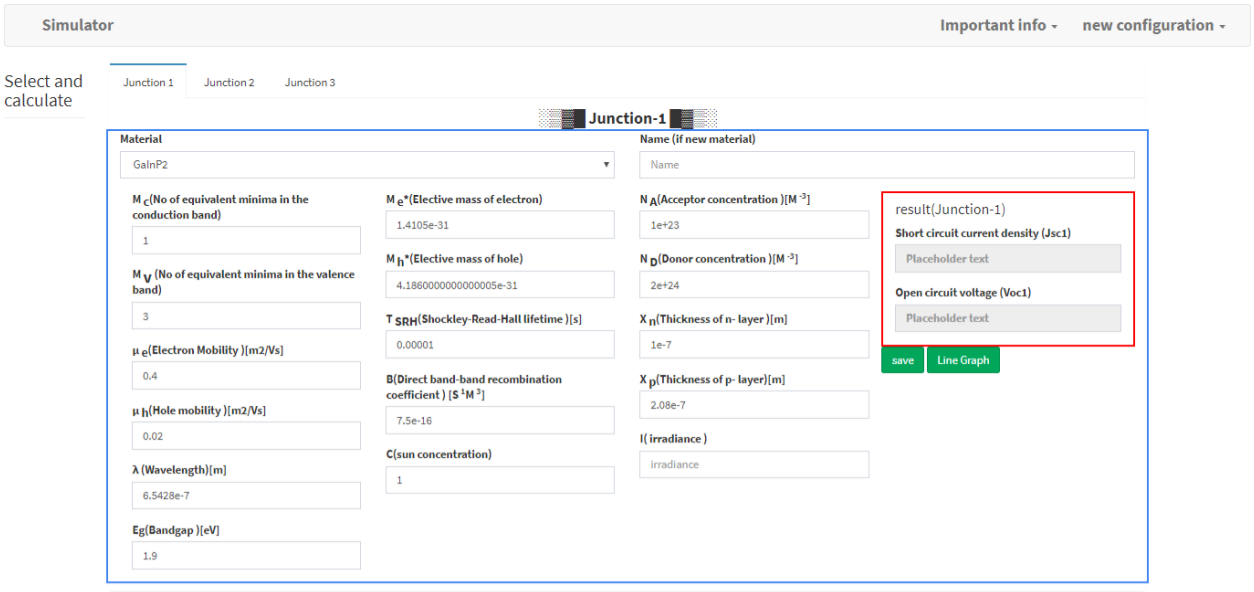


2. Material (Junction-layer) selection for each junction

2.1 The user has to select the appropriate materials from the following combo box. This simulation software already has reserved some popular materials information and parameters.



2.1 The software will populate all the parameters automatically except 'irradiance value' for the reserved materials.

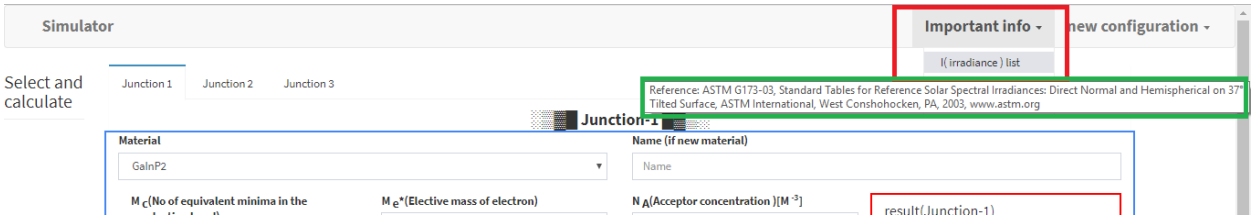


2.3 **For new materials (other than reserved)**

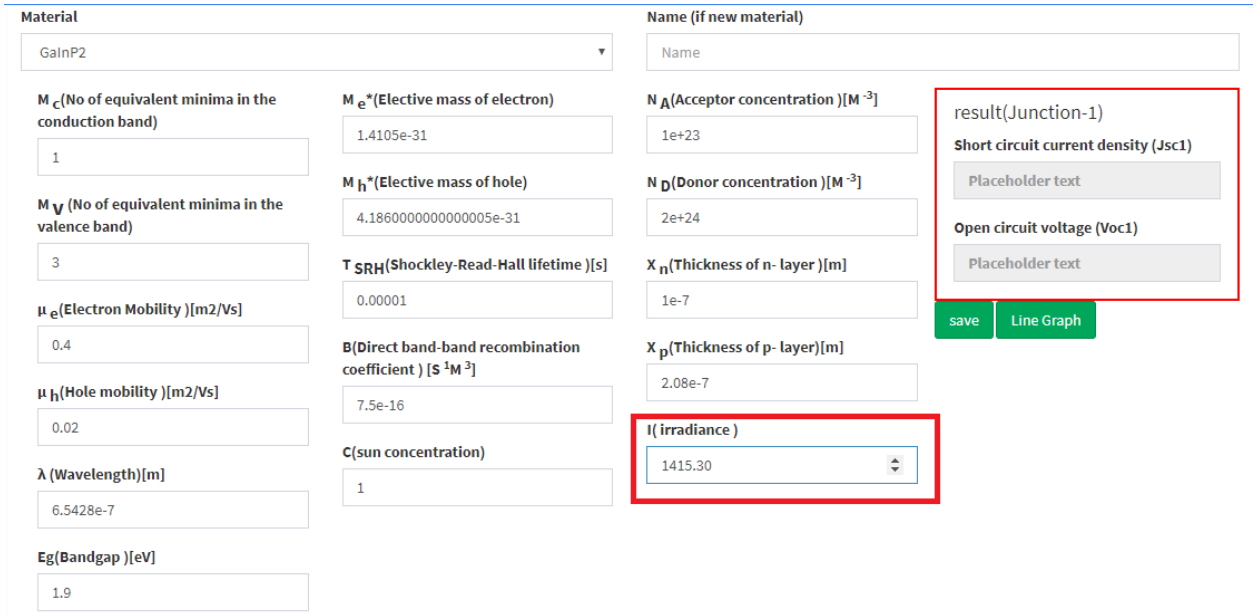
For new materials the user has to input the name of those materials as well as all relevant parameters manually. Afterward the user can calculate and get similar types of result just like the reserved materials.

3. Input I (irradiance)

3.1 The user has to input the irradiance value. User can find the ASTM G-173-03 reference spectrum (irradiance value) from the following sub-menu marked red.



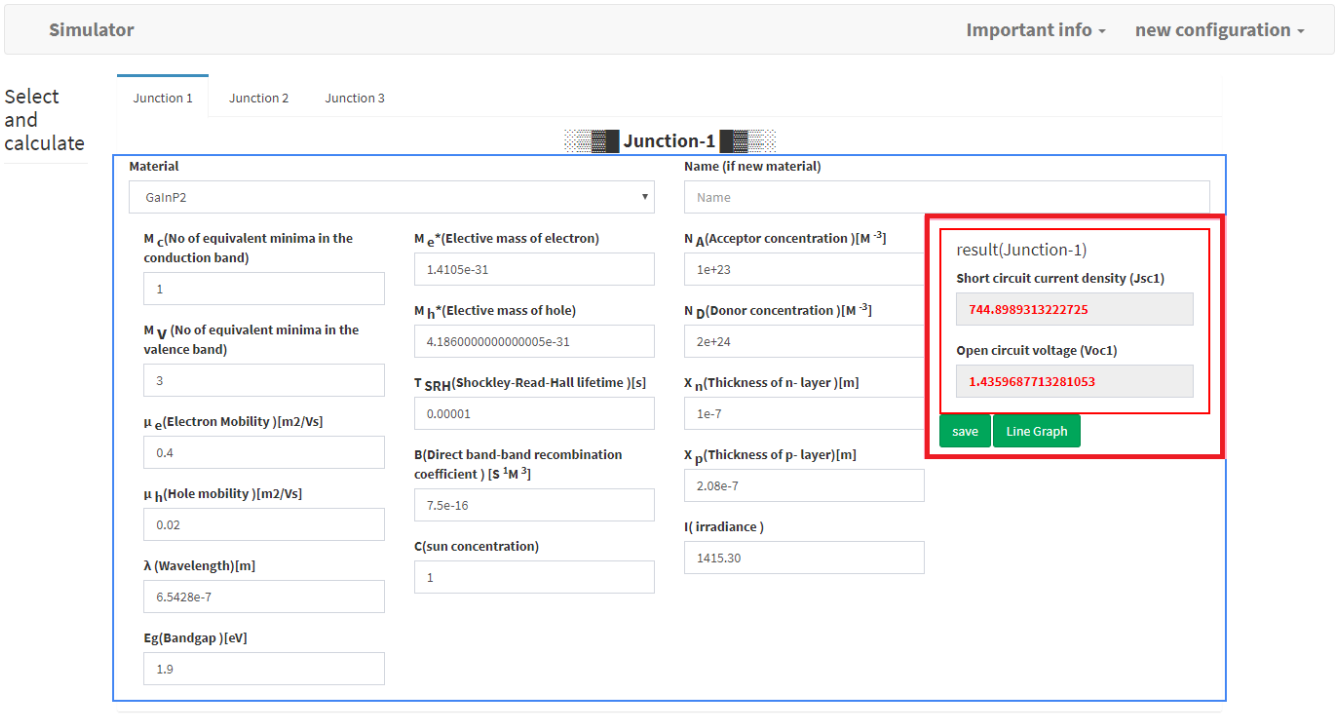
Find the suitable irradiance value from the ASTM G-173-03 reference spectrum and input it. (See the red rectangle below).



4. Find analytical result for a particular Junction (Layer of multijunction solar cell)

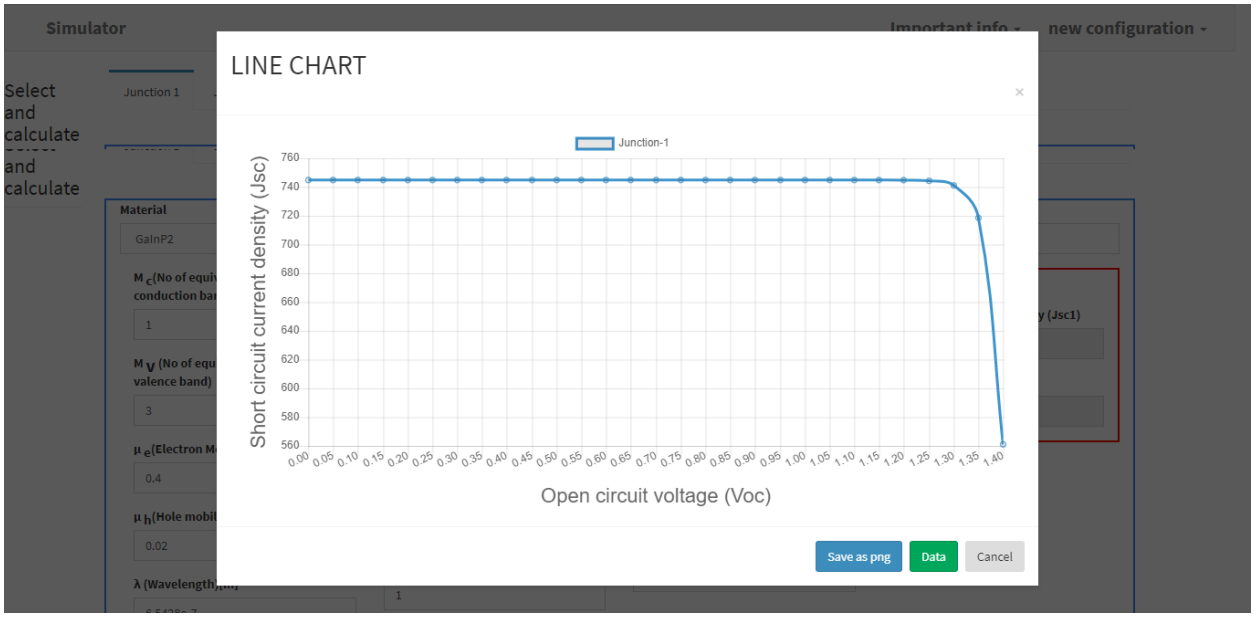
4.1 Find the result for short-circuit current density (Jsc) and open circuit voltage (Voc):

After putting all parameters, one has to click “save” button (see the red line rectangle) and this will give short circuit current density (Jsc) and open circuit voltage (Voc) for that particular junction.



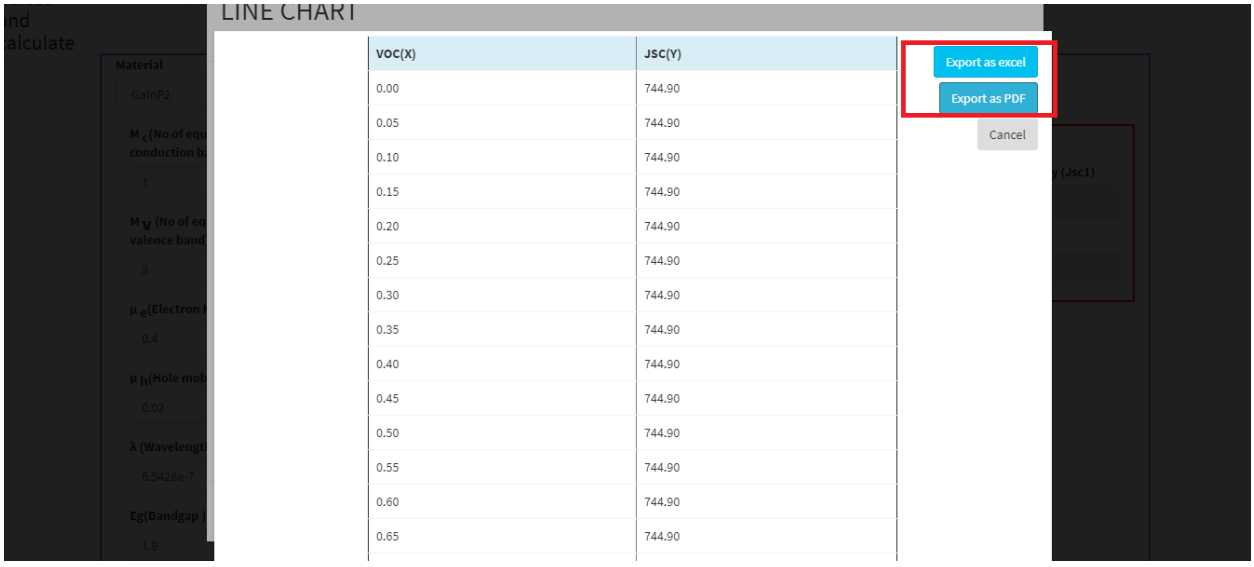
4.2 Current voltage characteristics curve (J-V):

For finding the J-V characteristics curve, the user has to click “line graph” button shown below and the following curve will pop-up.



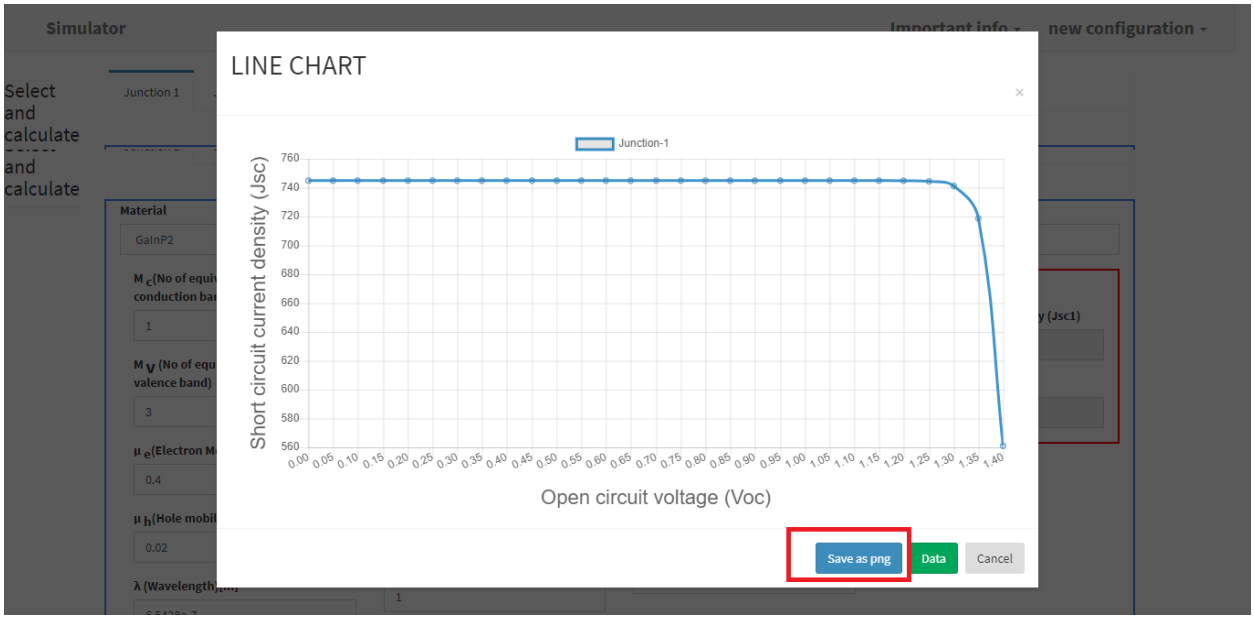
4.3 Export the simulated dataset:

There is an option for the user to find the dataset for further data analysis and graphing using any thir dparty softwares, for example OriginLab, Excel etc. For that, one has to click “Data” button and export data set as excel or pdf format (see red rectangle).

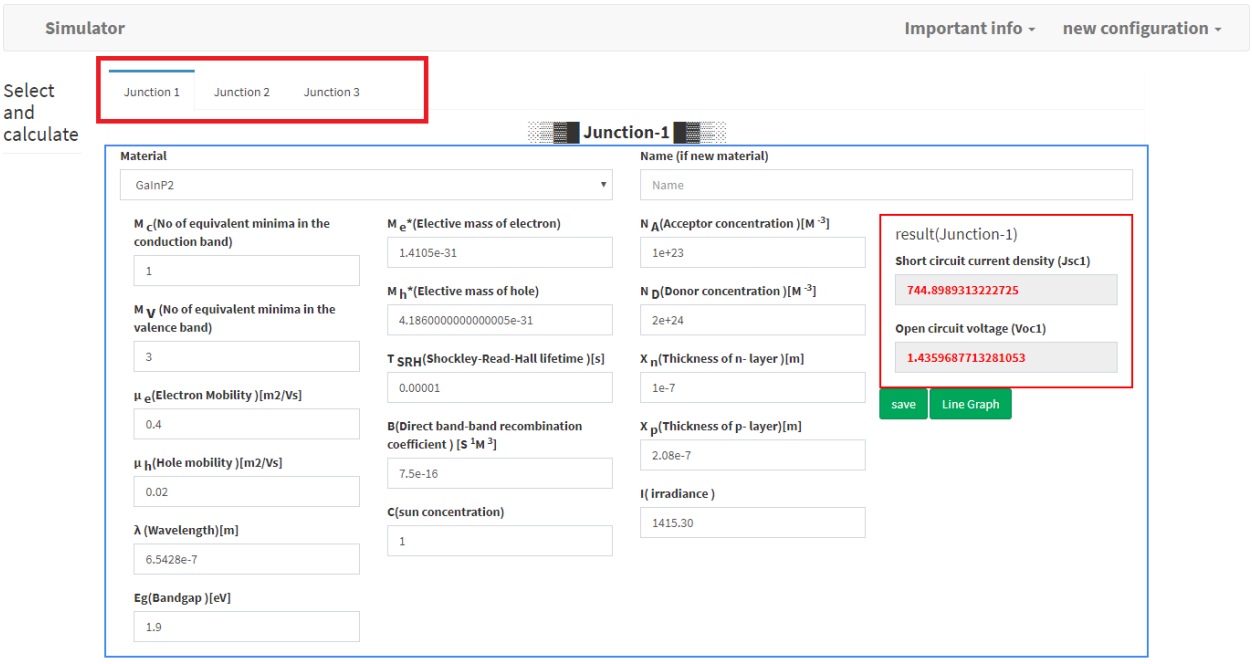


4.4 For downloading the graph:

The user can download graph as PNG format by clicking “Save as png” button



[N.B: By that process, user has to select the junction and calculate repeatedly for each junction]

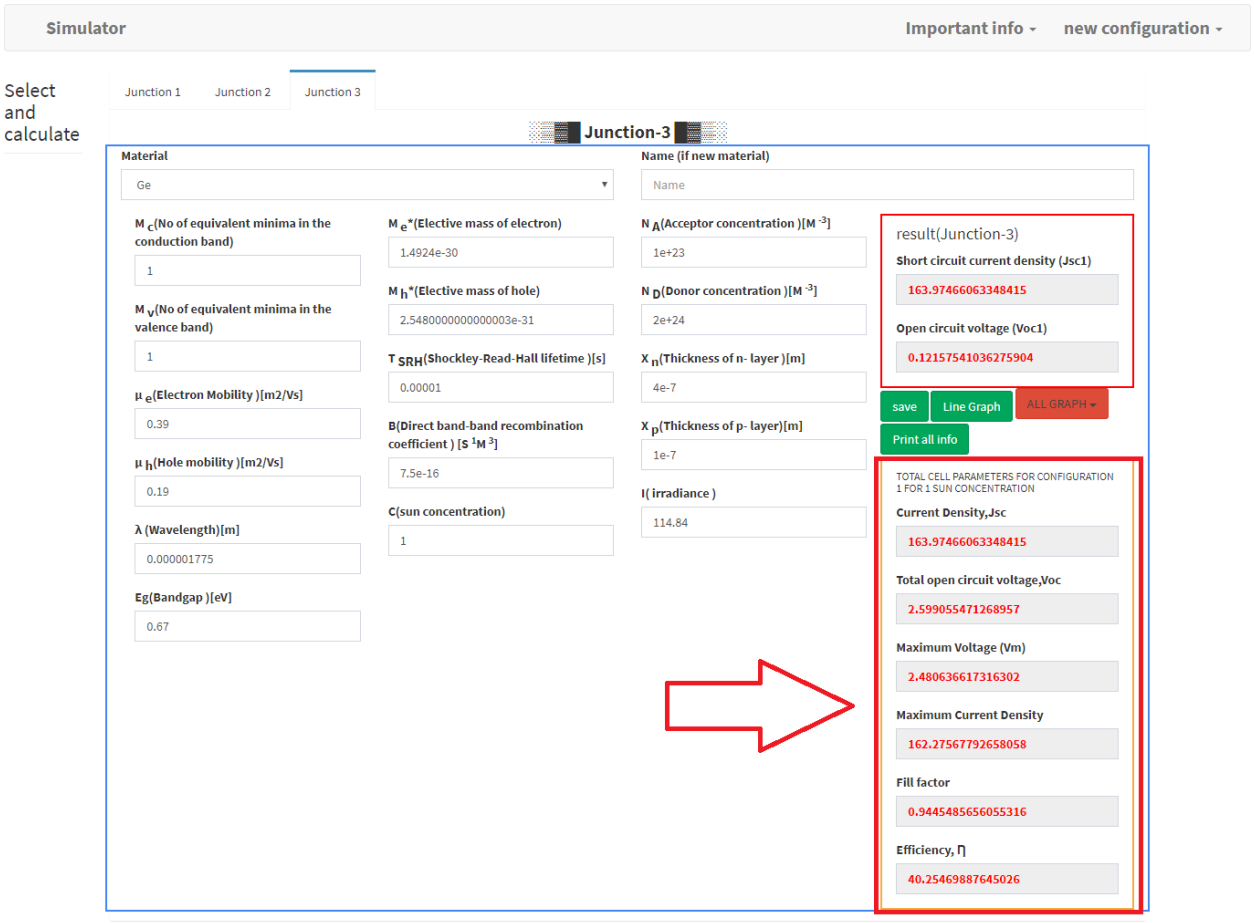


5. Get the results for each configuration (for all junction)

5.1 Find result (see the red mark rectangle):

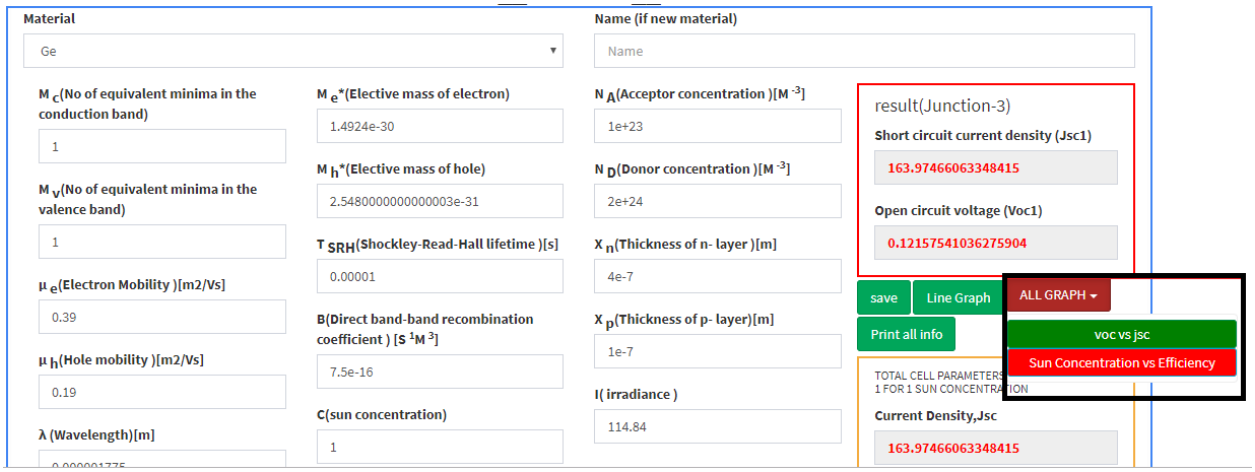
After simulating and saving for each junction, user may get some results for each configuration (Total cell parameters for configuration 1 for normal atmospheric condition (1sun concentration) as follows:

a) Total open circuit voltage, VOC
b) Current density, JSC
c) Maximum voltage(Vm)
d) Maximum current Density
e) Fill factor
f) Efficiency, Ƞ

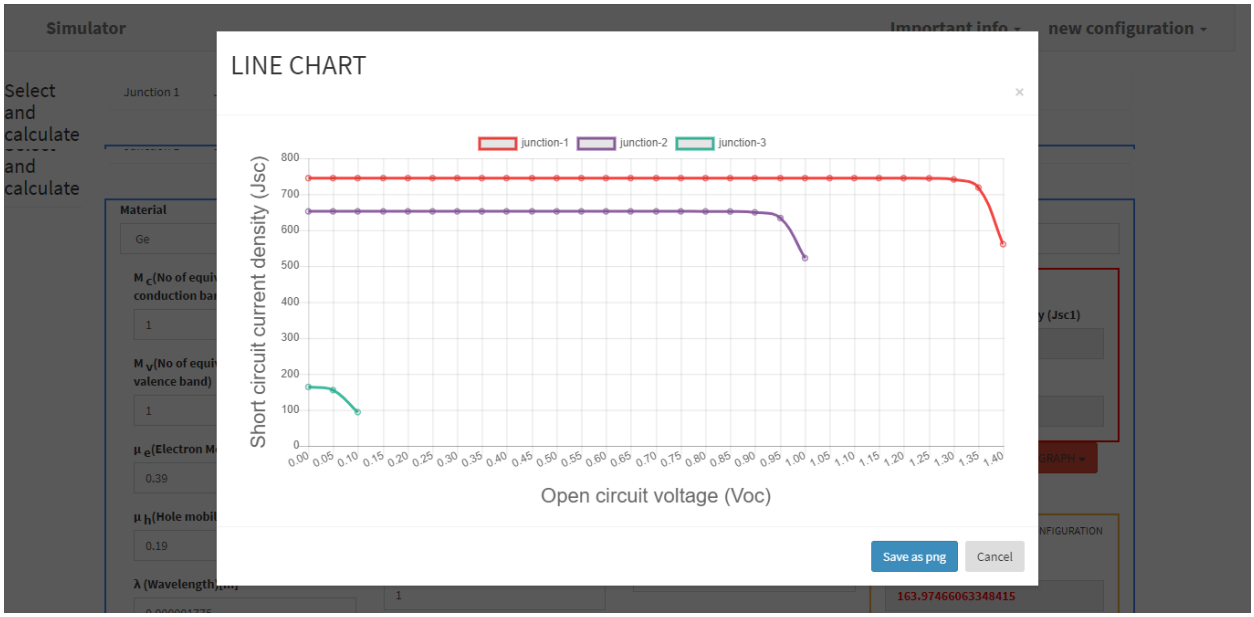


5.2 Get graphical view:

The user will find several graphs (see the black- line rectangle)

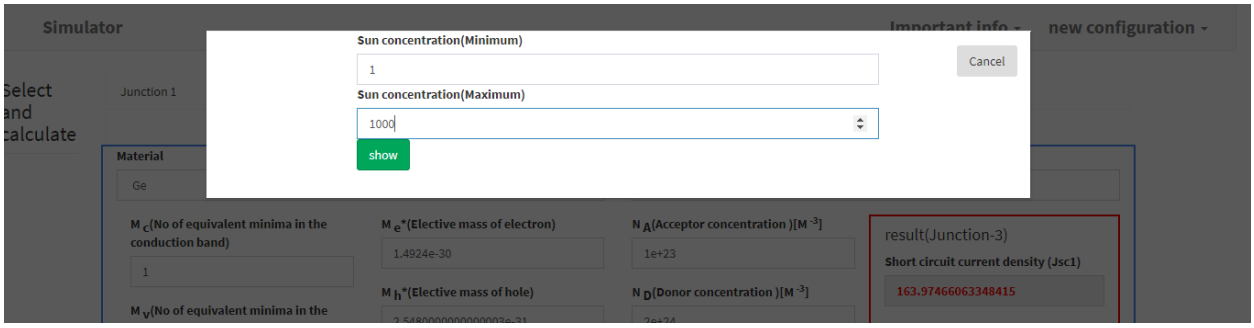


a) J-V characteristics curve for all layers (junctions).

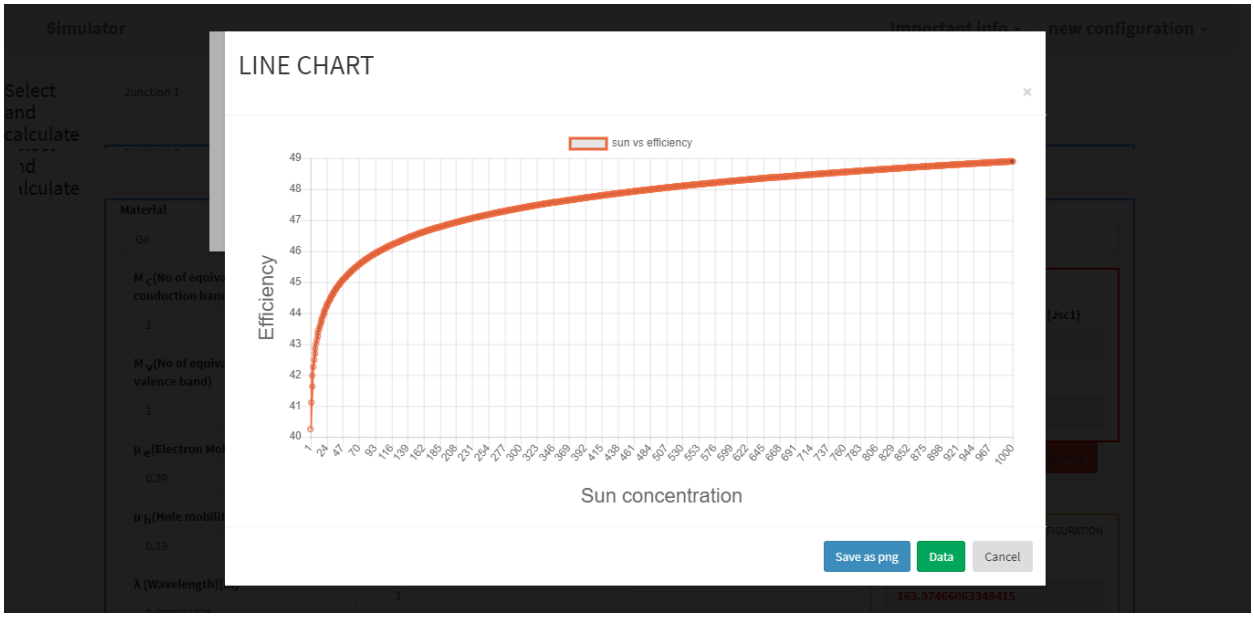


b) **Sun concentration Vs. Efficiency graph**:

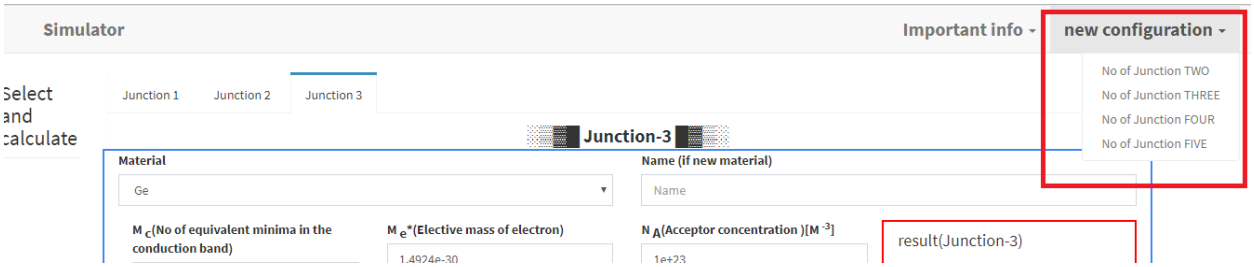
User has to define the limit of the sun concentration 1 to 1000



User will find the following graph. One can also export data and download graph.



Conclusion: Using the above mentioned procedure, user can simulate the other configurations of multijunction. For that user need to select another configuration from following figure (see the red rectangle).



Thank you !!!