EEE – STAR 2019

Fundamentals of Photovoltaics Training

Task #1

1. What is blackbody radiation? Explain.

2. Formulate blackbody radiation and plot spectral irradiance vs. wavelength of an object at 6000 K, 1500K and 300K for wavelengths between 0.1 – 100 μm. (You might want to plot with x and y axis in log scale to see all of them clearly in a single graph.)

3. Compare the spectral irradiance for 6000 K you have calculated in the previous step with the standard AM 1.5G and AM 0 spectrums. (You can find the data for these spectrums on www.pvlighthouse.com.au) Explain the reasons of differences between the ideal (the one you calculated) and actual spectrums (AM 1.5G, AM 0).

4. Using the AM 1.5G data, calculate the integrated radiation intensity from the sun between 250-4000 nm (the result is in W/m^2) and compare it with the radiation usable by **silicon**. Explain your results. Hint: Silicon has a bandgap of 1.12 eV.

Remarks

- Present your results in PDF format. You are **not required** to include your codes to the report, but you are free to do so if you wish.
- It is suggested that you use MATLAB for these tasks. However, you can also implement them in Python or C++ for your self improvement.
- You are not expected to do, but if you are interested, you are always welcome to implement a GUI, some simple sliders for graphs etc. to these codes and make tools out of them. If you do so, please let us know.
- You are encouraged to discuss the concepts with your friends and improve your understanding about them. However, you are expected to complete the tasks by yourself**,** as it is important for us to evaluate your skills and weakness' and assign to a project accordingly in the end.
- Have fun!