1 Information

- Excercises are solved in groups of 2
- You **must** submit .ipynb files with the code that you implemented
- Extra questions are solved in the last block of the .ipynb file
- Submissions should be made to:

  jeroen.cerpentier@kuleuven.be

- Deadline: end of this session

2 Review of past session

- I will briefly review last week's code

3 Improvements to 1D-setting

- File: p2_abc.ipynb
- Load the code from the previous session into this file
- Implement ABC for the left and right edges of the domain
  - **TIP**: this can be done by introducing an opposite wave, but is much easier to do by following an intuitive approach. Try to "continue" the wave on the outer indices.
- Include a way to introduce a material with different permittivity, and observe its effect
- Plot the 1D z-component of the electric field, and draw lines where the material with different permittivity is on the x-axis (use plt.axvline())

Question:

- Explain in your own words how you modelled location-dependent permittivity
  - If you did not manage to code this, explain how this could be modelled

4 2D-Maxwell Equations

We will study the pattern of a source inside an apartment and study how the waves evolve through time. The code that makes the room (makeRoom.ipynb) is already supplied.

- File: p2_2d.ipynb
- Steps:
  1. The dimension of all fields will be 100x100. Initiate five empty matrices:
     - Magnetic field x-component
     - Magnetic field y-component
     - Electric field z-component
     - Electric field z-component in the x-direction
     - Electric field z-component in the y-direction
  2. Add a source to the electric field
     - You can choose its coordinates yourself, but pick a position that, according to you, is efficient to spread the radiance across the entire apartment
  3. Complete the Finite Difference equations in the for-loop
  4. (*Hard*) Find an intuitive, but efficient way to obtain the following:
     - Calculate any type of time averaged/binned intensity of the electric field inside the apartment
  5. Make a 2D plot showing the rooms in the apartment and the intensity measure of (4) inside of it

Question: which position did you choose for the electric component, and why?