

Exercise 1

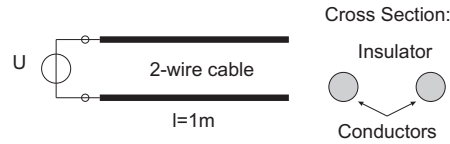


Figure 1: 2-wire cable setup and cross section of 2-wire cable.

A 1 m long piece of 2-wire cable is depicted in fig. 1. At one end of the cable a constant voltage source is attached whereas the other end is open. The wires of the cable are assumed to be ideally conducting while the medium between the wires is an ideal insulator.

- Will there be an electric field, a magnetic field or both in between the wires?
- Which of Maxwell's equations govern this field?
- Which material equation is involved?
- What are the boundary conditions of this field?
- How can the in b) selected set of equations be simplified?
- Do the boundary conditions correspond to Dirichlet or Neuman boundaries, if you look at the associated potential?
- Where in the cross section of the cable do you expect the highest field strength.

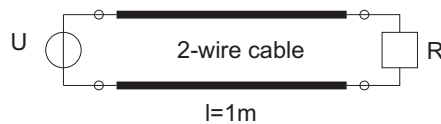


Figure 2: 2-wire cable setup terminated with resistor.

Now the second end of the cable is terminated with a resistor R .

- Compute the current in one wire.
- Will there be an electric field, a magnetic field or both in between the wires?
- Which of Maxwell's equations govern these fields?
- Which material equation is involved?
- What are the boundary conditions of these fields?