

ELEC 0041: Homework 2 - due on April 13 2021

Starting from the optimal geometrical configuration of the conductor bundle obtained in homework 1, analyze the magnetic behavior of the 3-phase system made of three of such bundles located in a flat formation, with an a priori unknown inter-bundle distance (center-to-center) of ℓ meters.

The 3-phase voltages are fixed to a maximum (peak) voltage of 600 kV, with phase-shifts of a balanced direct system.

You are asked to

- determine the inter-bundle distance ℓ to satisfy the same electric field constraints as in homework 1;
- using this inter-bundle distance, determine the allowed nominal current, taking into account skin and proximity effects, provided that the maximum (peak) current density is $5\text{A}/\text{mm}^2$;
- calculate the level of magnetic flux density in a 3×3 m control room located 4 m to the right of the rightmost conductor;
- design a magnetic and/or conducting shield to reduce the maximum magnetic flux density by one order of magnitude in the control room;
- compute the power losses (per meter) in the conductors and in the shield.

Write a max. 4 page report where you present and comment your results.

Send your report by email to cgeuzaine@uliege in PDF format together with your model files, bundled in a single .zip file named `hw2_FirstName_LastName.zip`.