Choice of electrically conductive plate for shielding the magnetic field from underground High Voltage cables

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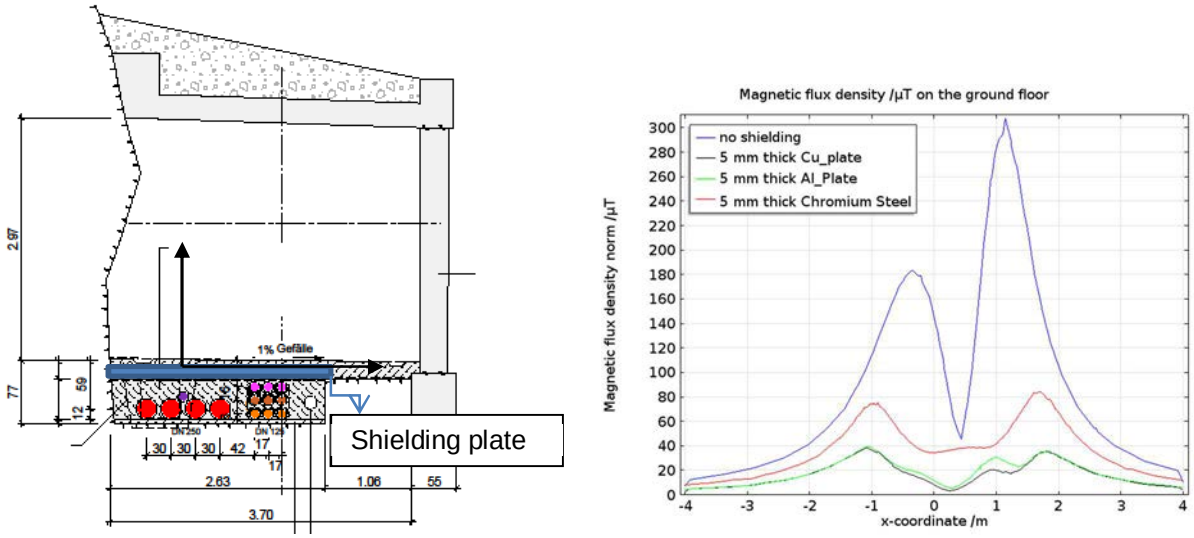
This paper reports the design and simulation of electromagnetic shielding for a 275kV power system to be installed in Austria with a requested limit of magnetic field to public area of max 100 µT. The allocations and current rating of high voltage cables are predefined.

Finite Element Method (FEM) is used for the calculation of the magnetic field. The preliminary results show the exposure limit can be kept in some situations by arranging the current phases in a right way without any shielding. For other cases magnetic shielding has however to be applied.

Plates are the best choice for installation in respect of space limitation of allocations. Further FEM simulations are executed for selection the material and size of the plates. It has been found out that using plate made of nonlinear magnetic material the magnetic field is much enhanced at the borders of the plate and the ohmic loss in it is even bigger than the loss in cable conductor. Conductive plates have shown a better shielding effect and the energy losses in them are considerably lower. From the technical point of view copper is best suited but it would result in an expensive solution. As a final result Aluminum is selected as the plate material.

When transforming the analytical solution into a practical installation additional challenges have to be overcome. The problem of Al oxidation and galvanic corrosion should be taken into consideration, installation accessories made of non-magnetic material have to be used to avoid local enhancement of magnetic field, etc.



An example of allocation of high voltage cables and the corresponding FEM calculation results