Power transmission lines simulation with QuickField. Part 2

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Introduction

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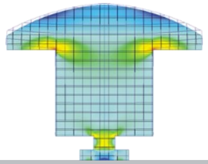
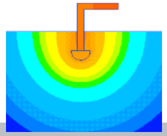
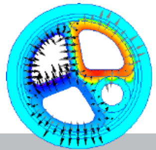
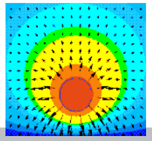
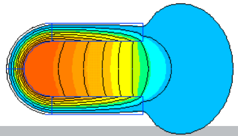
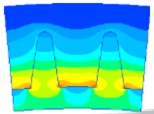
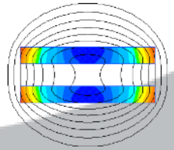
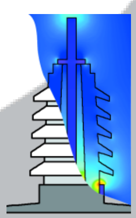
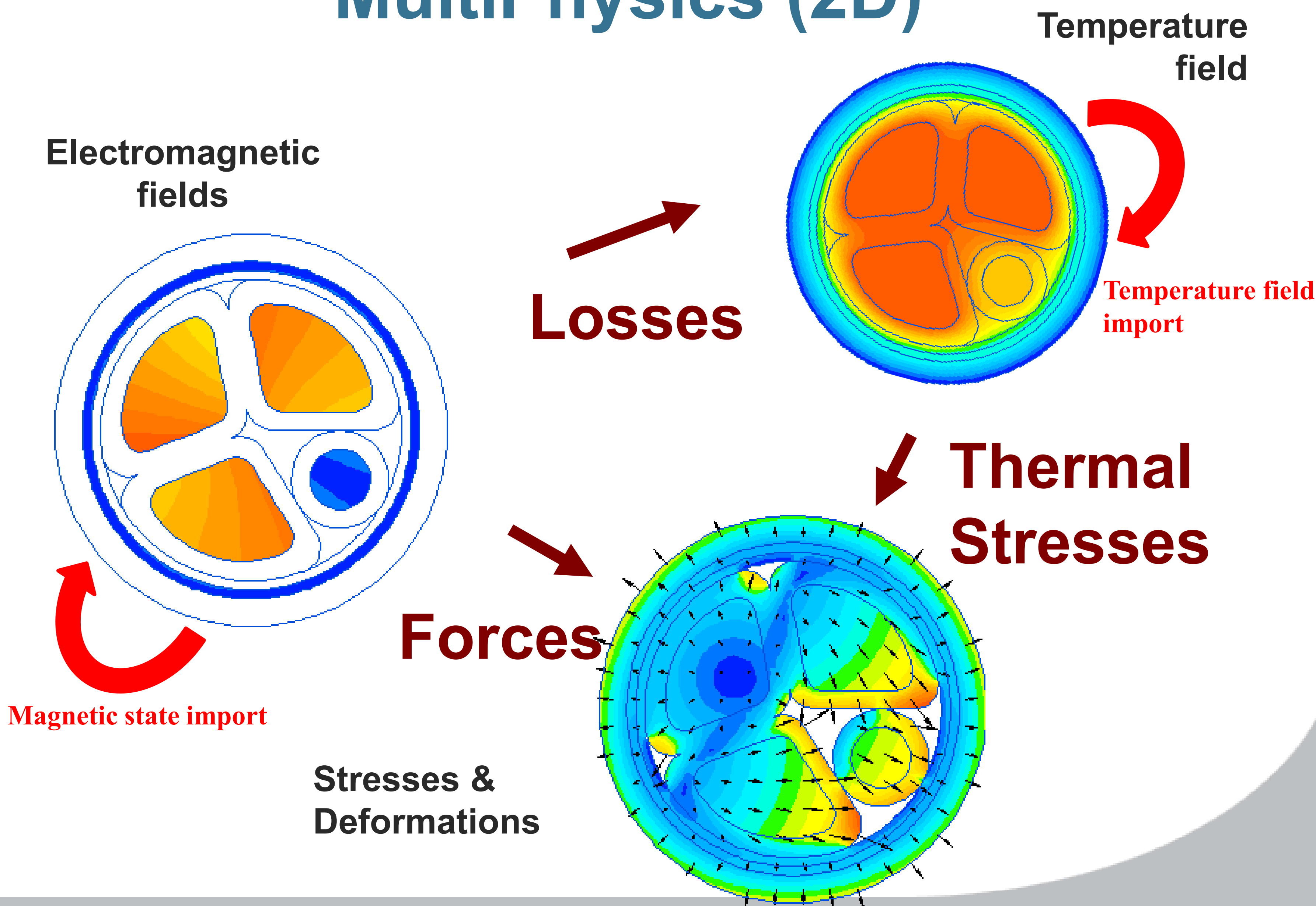
Live demonstration

QuickField Analysis Options

Magnetic analysis suite	
Magnetic Problems	Magnetostatics
	AC Magnetics
	Transient Magnetic
Electric analysis suite	
Electric Problems	Electrostatics (2D,3D) and DC Conduction (2D,3D)
	AC Conduction
	Transient Electric field
Thermostructural analysis suite	
Thermal and mechanical problems	Steady-State Heat transfer (2D,3D)
	Transient Heat transfer
	Stress analysis

MultiPhysics (2D)

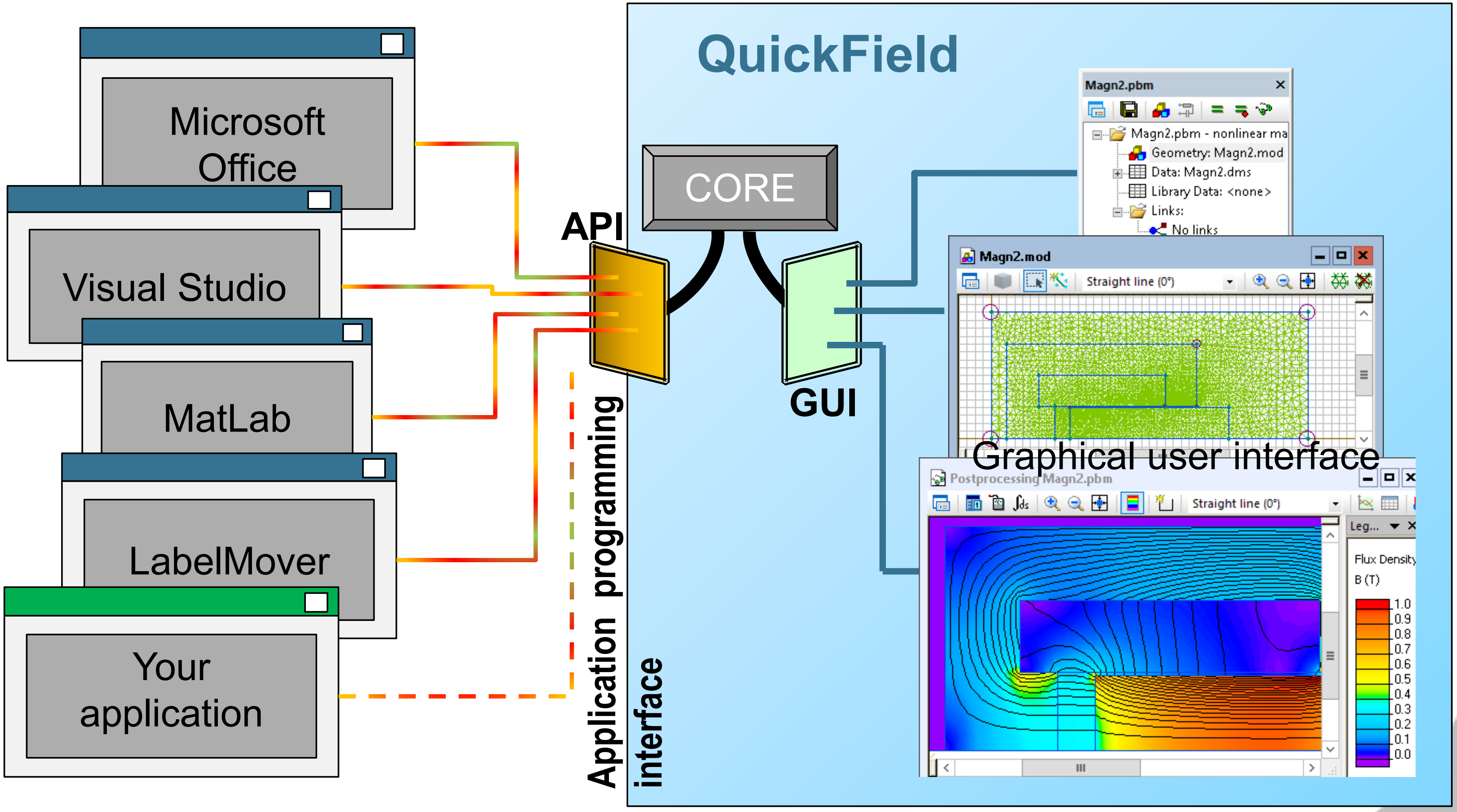


MultiPhysics (2D)

Source problem ---> |*Transferred data*|---> **Destination problem**

Destination: / **Source**:	DC magnetics	AC magnetics	Transient magnetics	Static heat transfer	Transient heat transfer	Stress Analysis
DC magnetics	Magnetic permeability	Magnetic permeability	Initial magnetic field			Force
AC magnetics				Joule heat	Joule heat	Force
Transient magnetics			Initial magnetic field	Joule heat	Joule heat	Force
Electrostatics						Force
DC conduction				Joule heat	Joule heat	
AC conduction				Joule heat	Joule heat	Force
Transient electric						
Static heat transfer		Temperature			Initial temperatures	Temperature
Transient heat transfer		Temperature			Initial temperatures	Temperature
Stress Analysis						

Open object interface



QuickField Difference

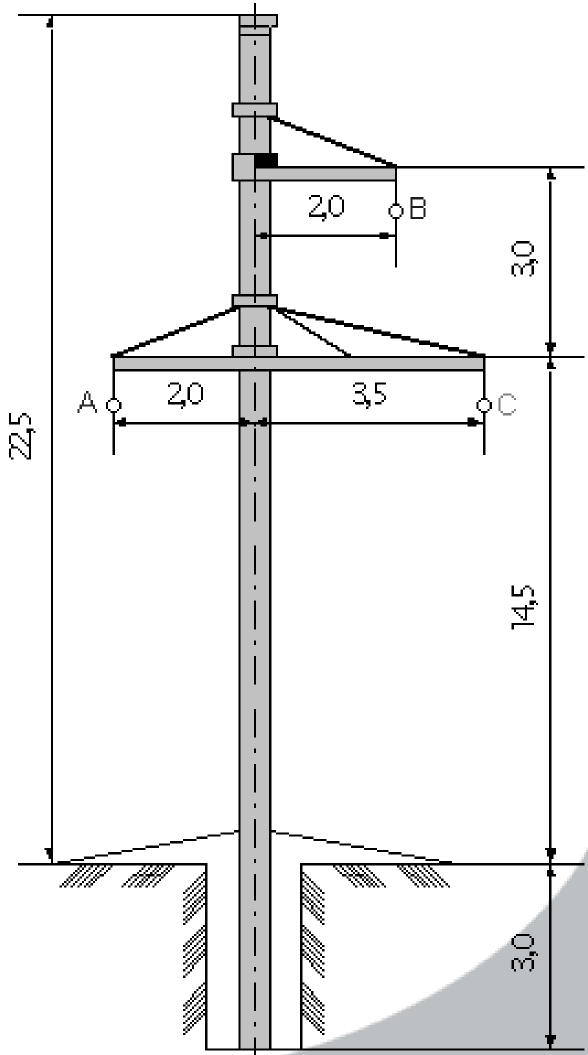
Field simulation software

www.QuickField.com

No training required

Power transmission lines simulation with QuickField. Part 1

1. Parallel wires capacitance.
2. Transmission line capacitance.
3. Fiber-optic cable and electric transmission line.
4. Parallel wires inductance.
5. Transmission line transposition.
6. Phase-to-phase fault.
7. Disc insulator. Heating.
8. Disc insulator. Mechanical stress.



https://quickfield.com/seminar/seminar_tline.htm

Power transmission lines simulation with QuickField. Part 2

Alexander Lyubimtsev
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1. Single-wire earth return (SWER)
2. Faraday cage
3. Transmission line electromagnetic compatibility (EMC)
4. Grading ring
5. High frequency line trap

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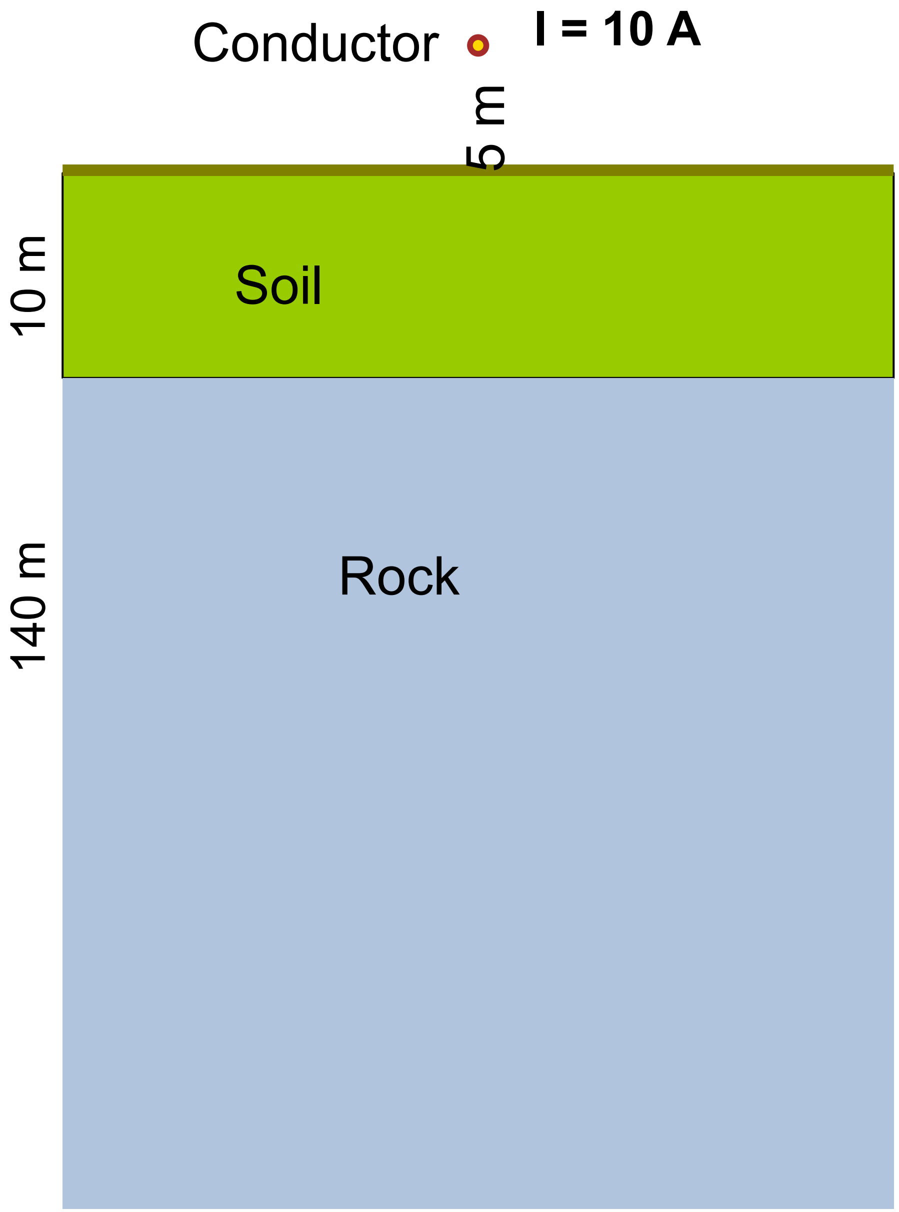
Single-wire earth return (SWER)



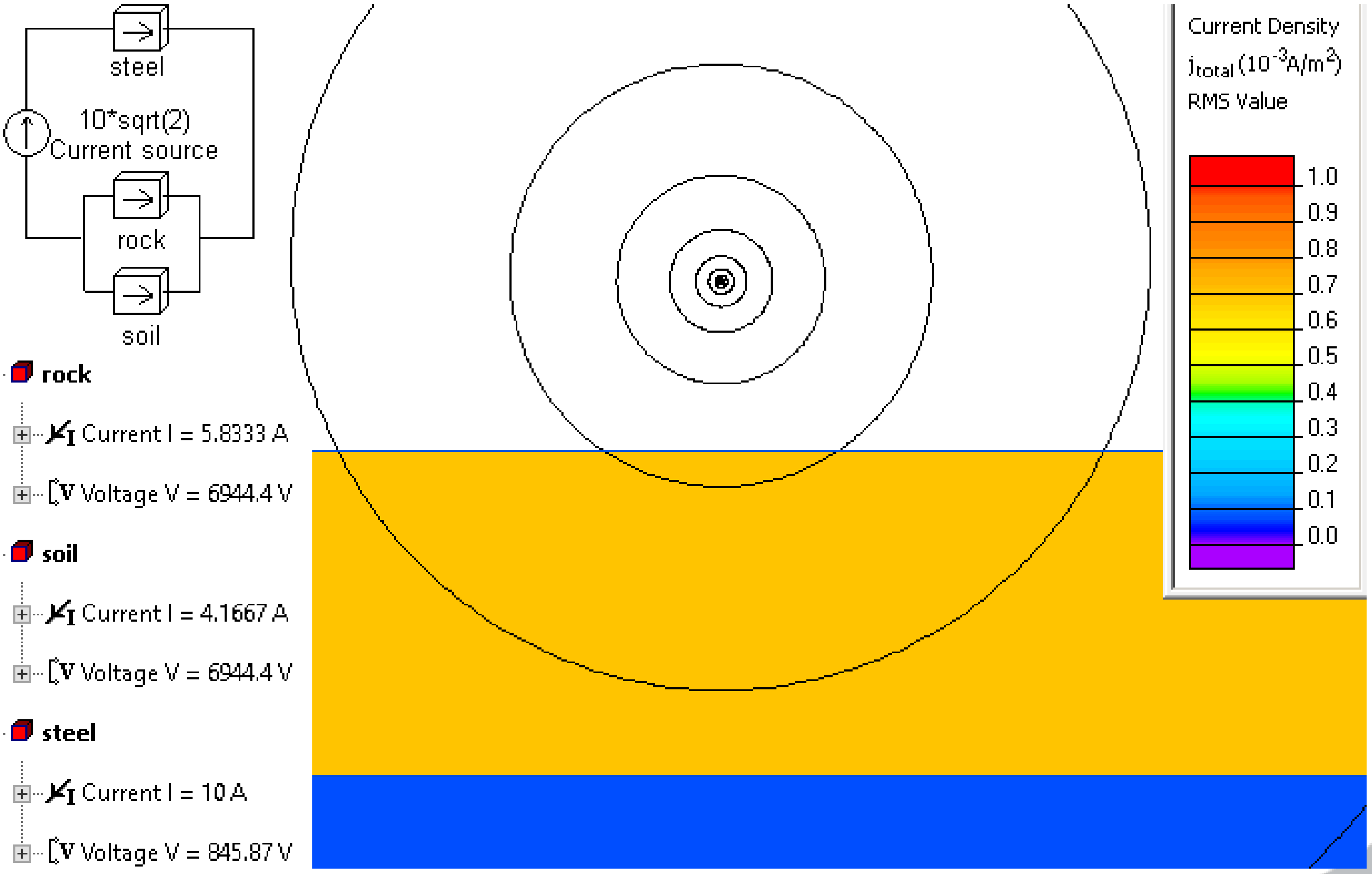
Problem specification:

Power line current I = 10 A
AC frequency f = 50 Hz
Line length L = 10 km.
Soil conductivity 1 mS/m
Rock conductivity 0.1 mS/m.

Task:

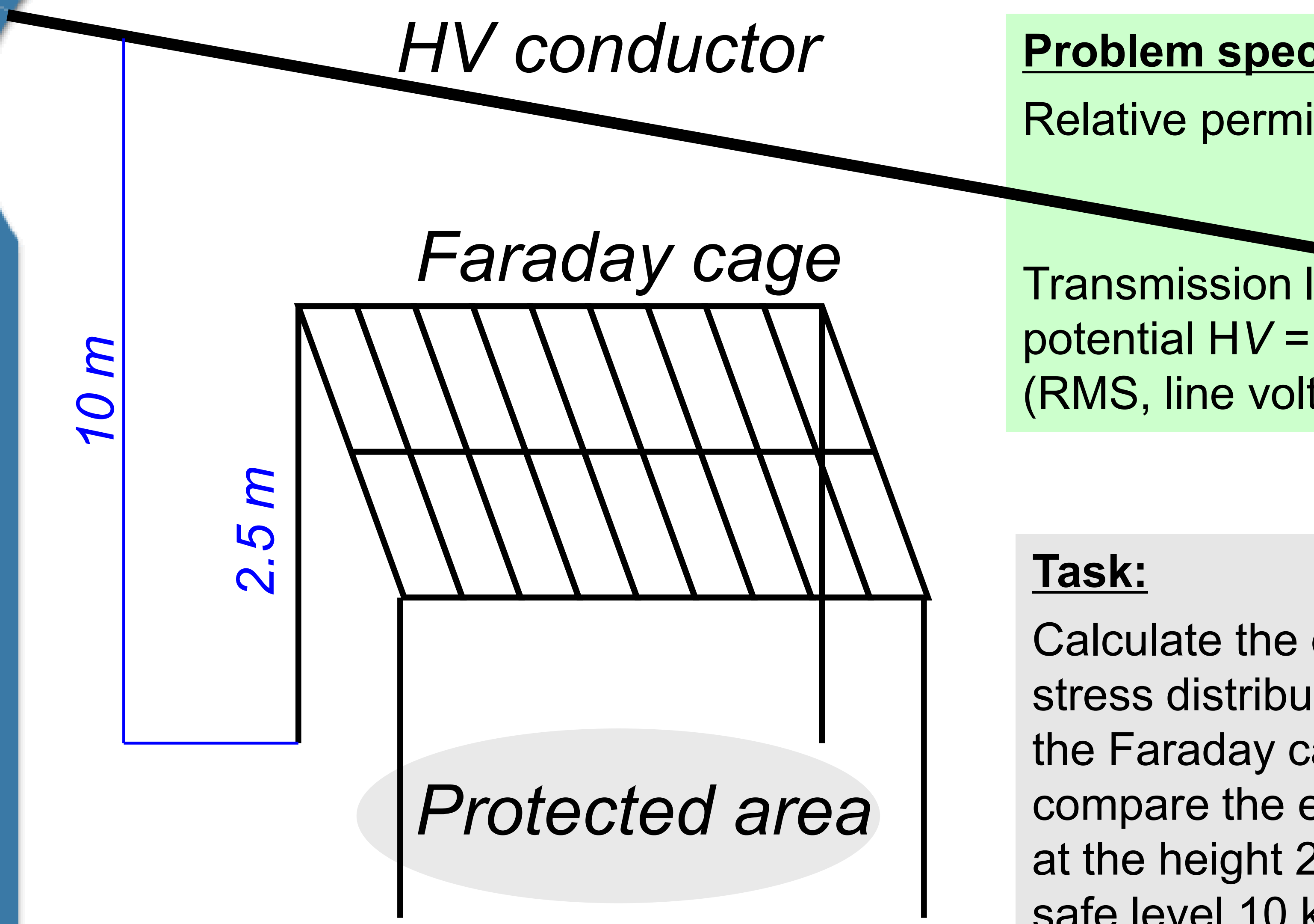
Determine the distribution of the reverse current density in the ground.

Single-wire earth return (SWER)



https://quickfield.com/advanced/swer.htm

Faraday cage



Problem specification:

Relative permittivity of air: 1

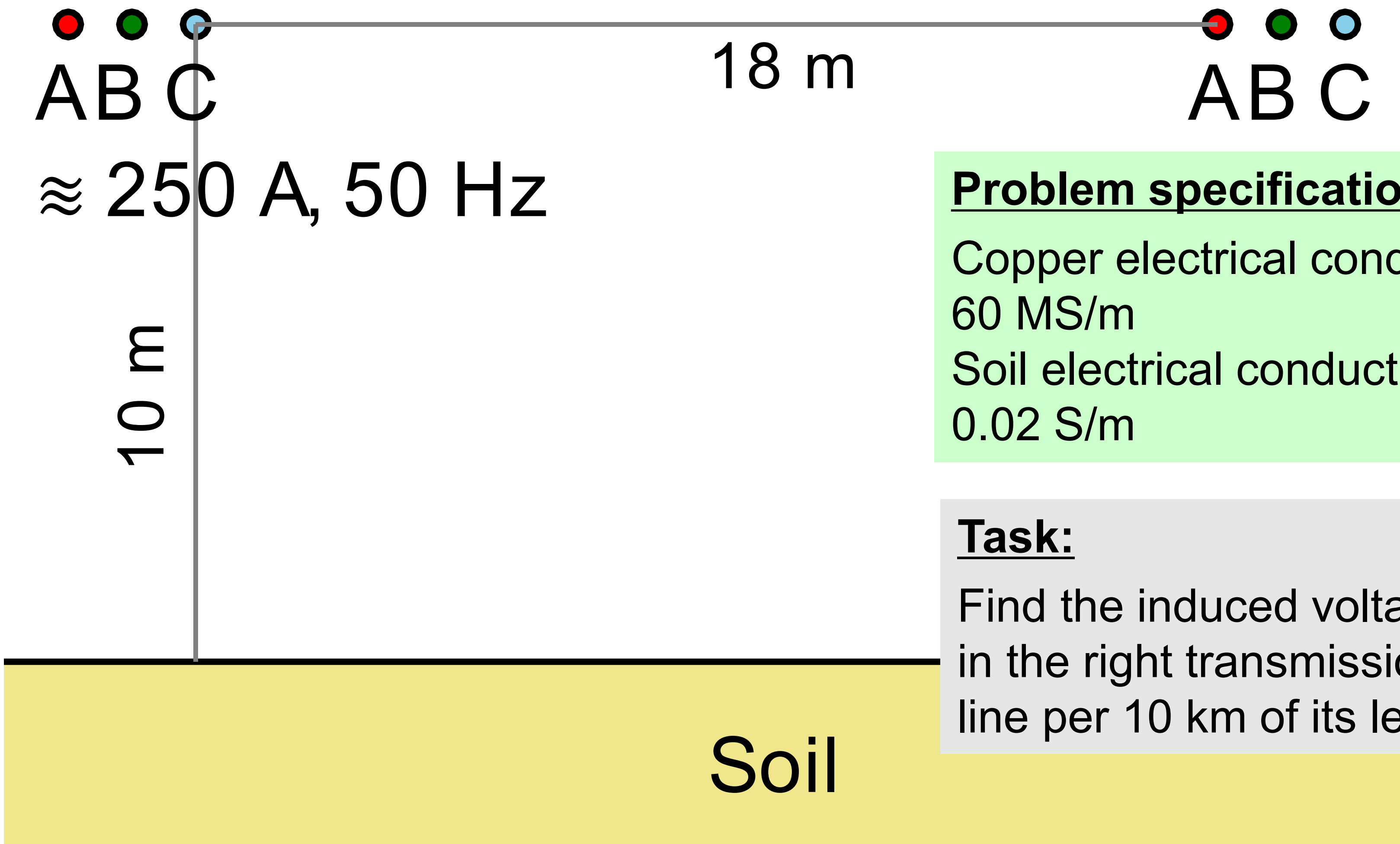
Transmission line electric potential H*V* = 330 kV (RMS, line voltage).

Task:

Calculate the electric field stress distribution under the Faraday cage and compare the electric stress at the height 2 m with the safe level 10 kV/m.

https://quickfield.com/advanced/faraday_cage.htm

Transmission line electromagnetic compatibility (EMC)



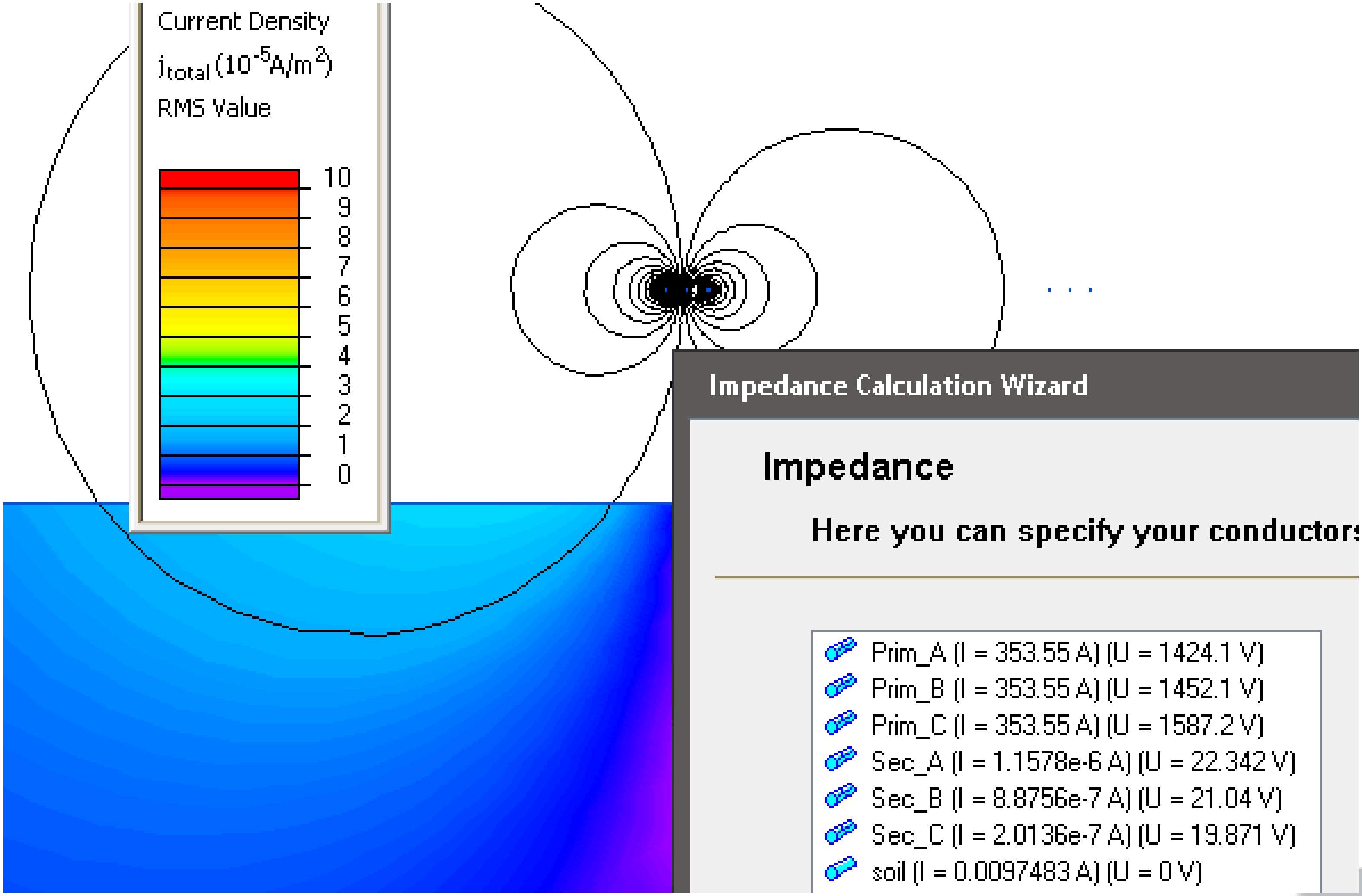
Problem specification:

Copper electrical conductivity 60 MS/m
Soil electrical conductivity: 0.02 S/m

Task:

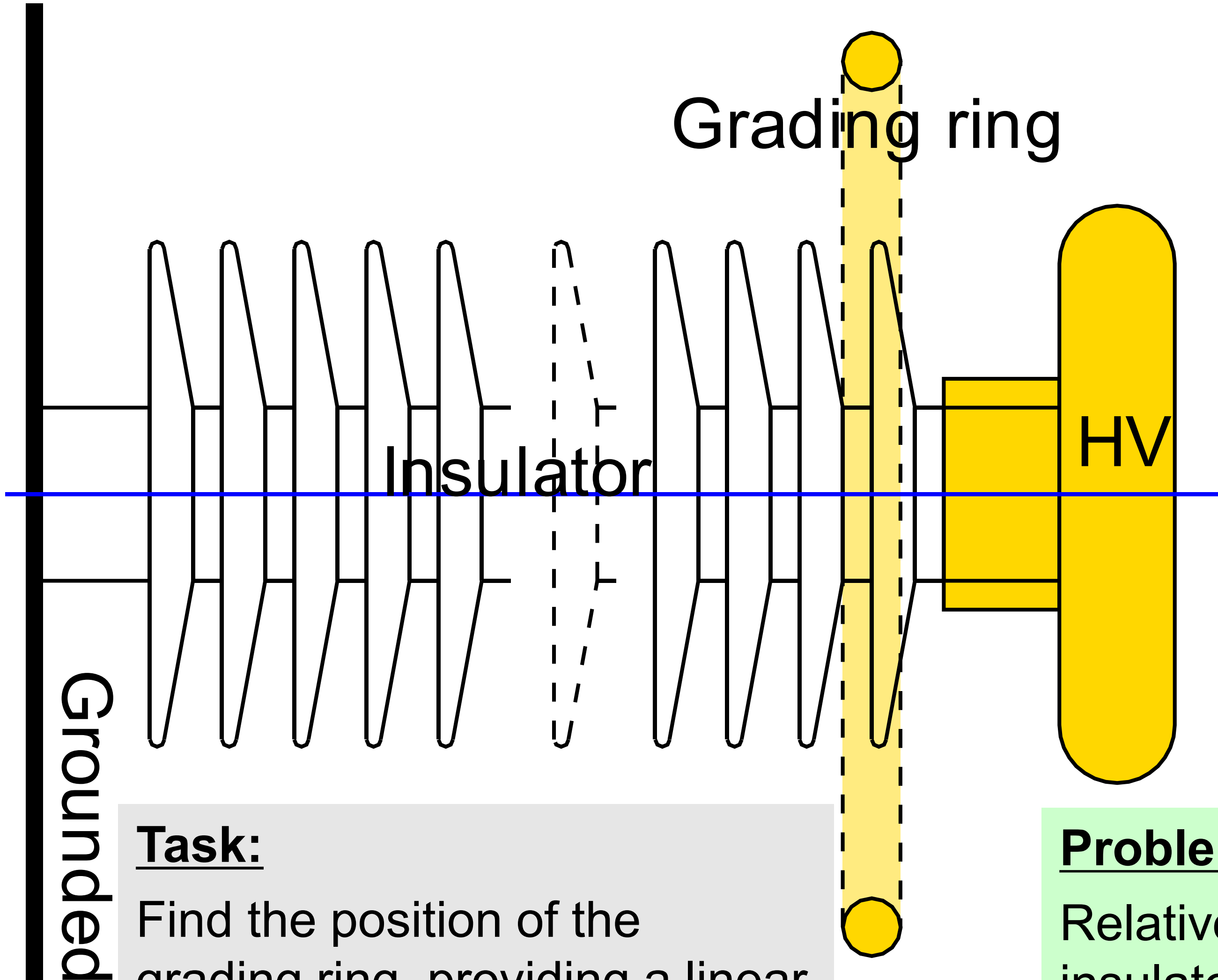
Find the induced voltages in the right transmission line per 10 km of its length.

Transmission line electromagnetic compatibility (EMC)



https://quickfield.com/advanced/tline_emc.htm

Grading ring



Task:

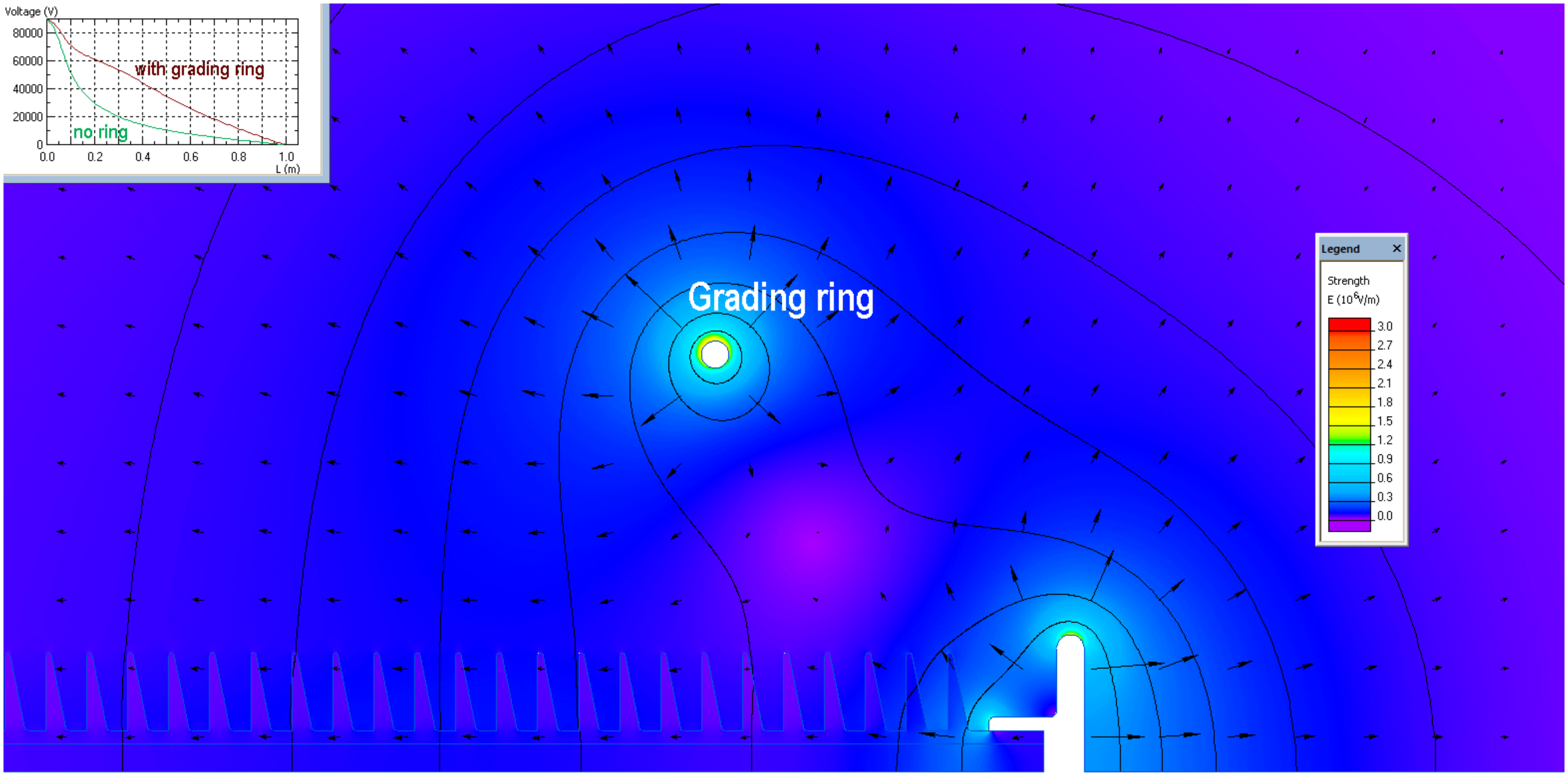
Find the position of the grading ring, providing a linear distribution of potential along the insulator central axis.

Problem specification:

Relative permittivity of insulator ε = 2;
High voltage = 110 kV.

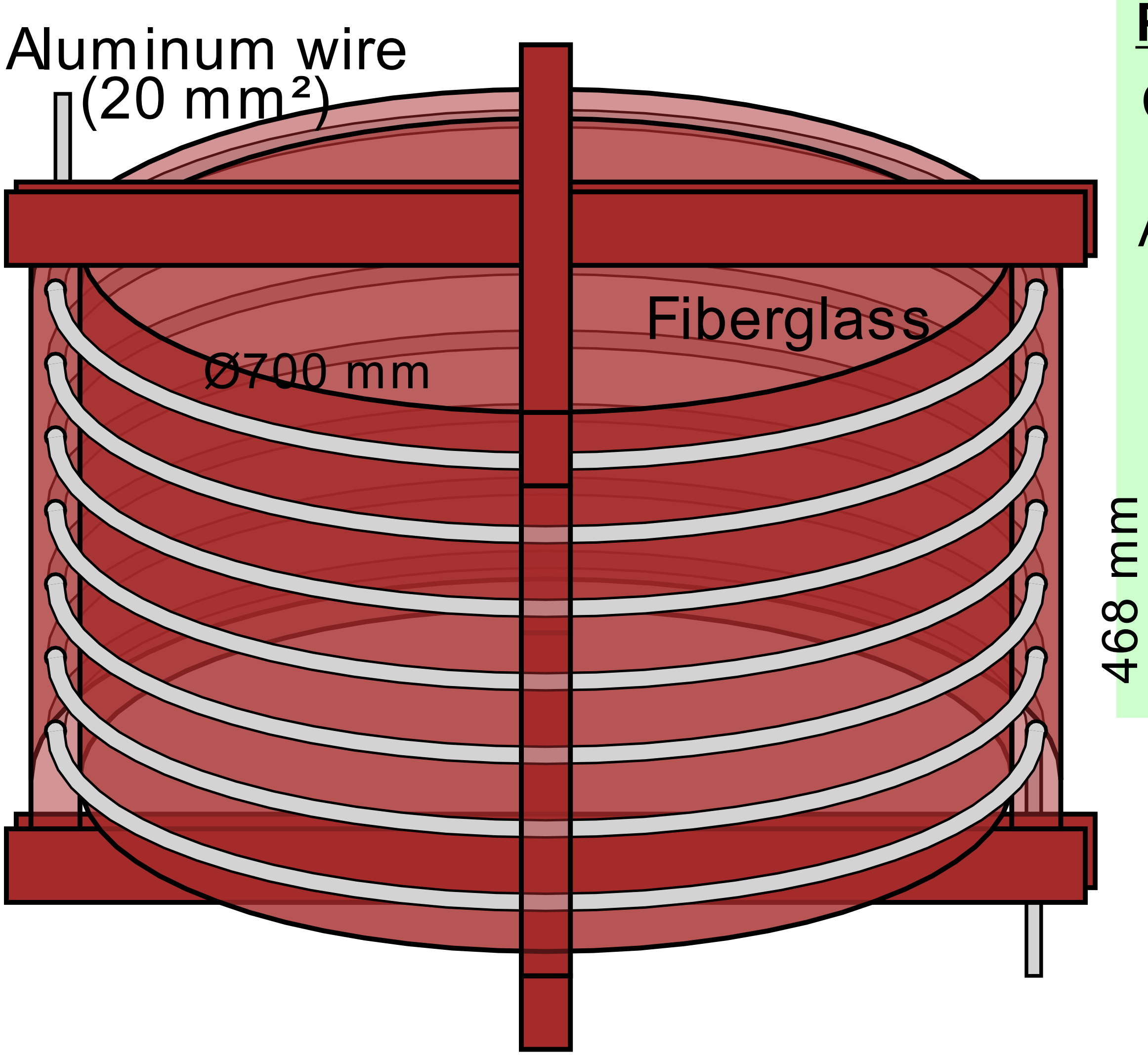
https://quickfield.com/advanced/grading_ring.htm

Grading ring



https://quickfield.com/advanced/grading_ring.htm

High frequency line trap



Problem specification:

Current (peak value) 12 kA,
AC frequency = 50 Hz
Aluminum Young's modulus
E = 70 GPa;
Poisson's ratio ν = 0.34;

Fiberglass
Young's modulus
E = 20 GPa;
Poisson's ratio ν = 0.11;

Task:

Calculate inductance, forces, mechanical stress