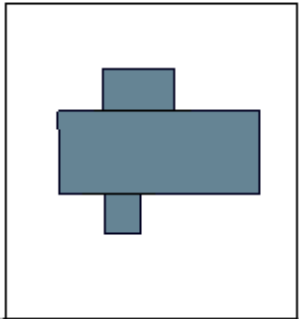# Power cables design with QuickField

1. Cable impedance (capacitance, inductance, resistance, losses)
2. Cable insulation stress, stress control tube.
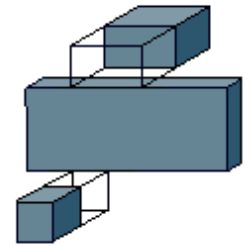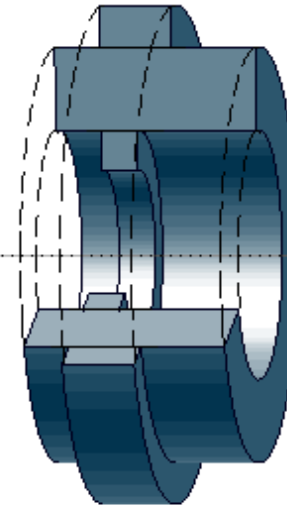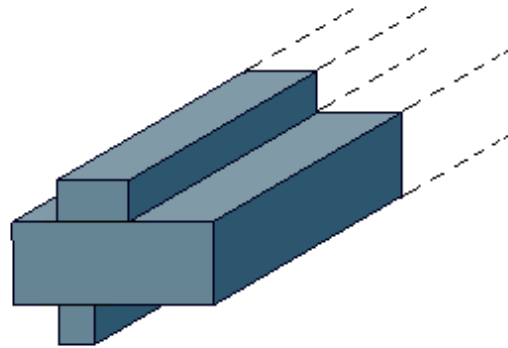3. Automated cable design
4. Cable termination 3D

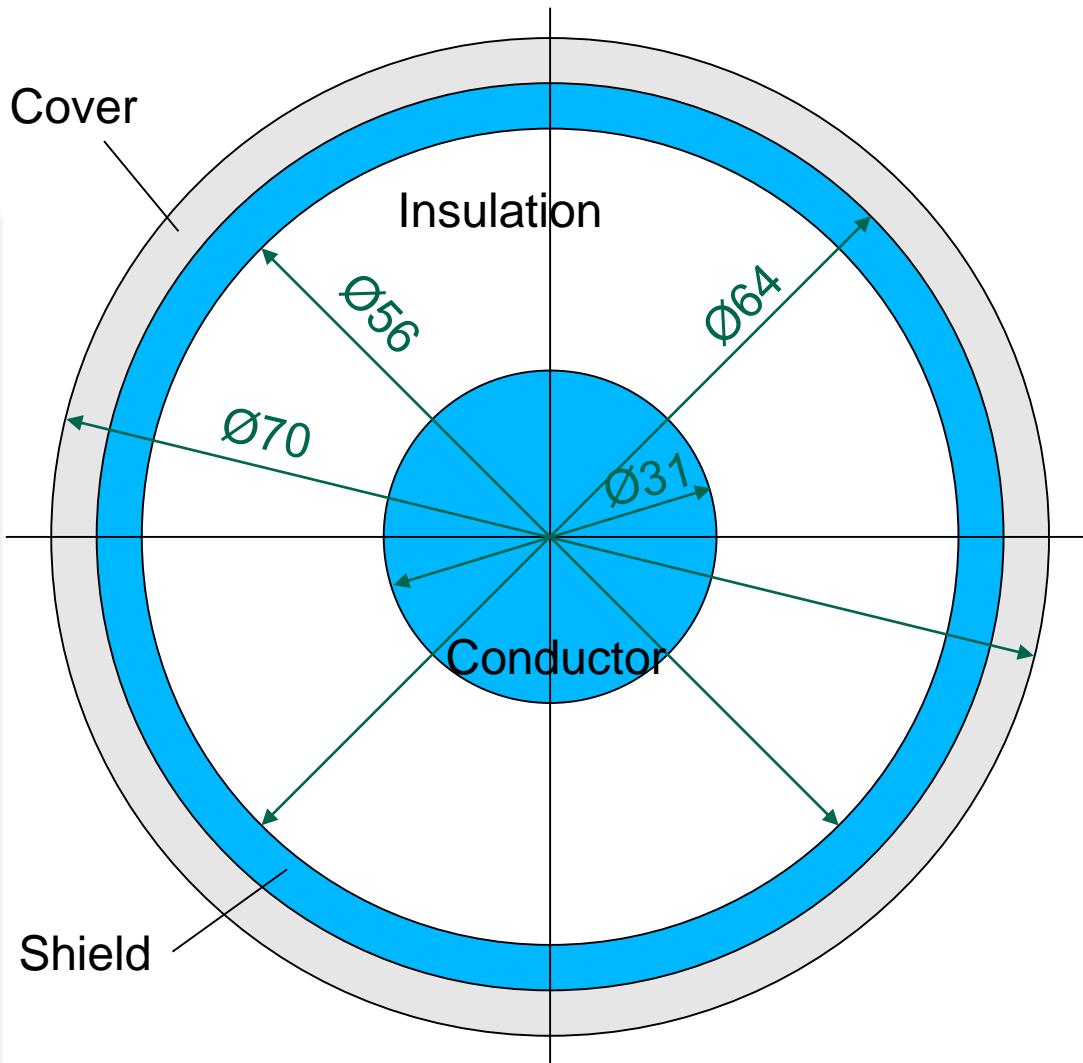# Linear contour in cylindrical problem

Model

Real object

plane-parallel

axisymmetric

3D extrusion

Cable impedance

Cover

Insulation

Ø56

Ø64

Ø70

Ø31

Conductor

Shield

Problem specification:

Cross-section A = 754 mm^2
Frequency f = 60 Hz
Voltage V = 110 kV
Current I = 1000 A

Tasks:

Capacitance, $\boldsymbol{C}$ [F/m]
Resistance DC and AC,
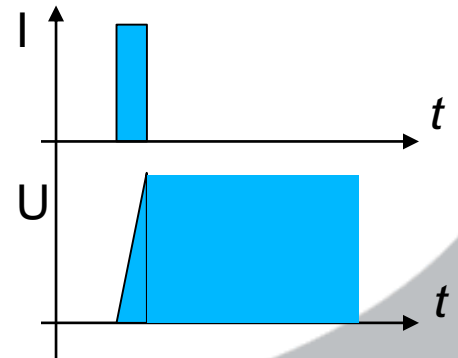$\boldsymbol{R_{DC}}$, $\boldsymbol{R_{AC}}$ [Ohm/m]
Inductance $\boldsymbol{L}$ [H/m]

Cable capacitance
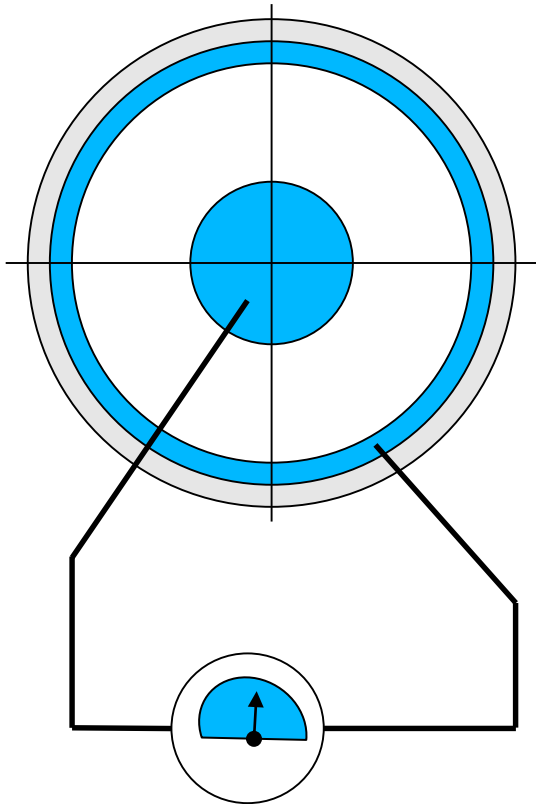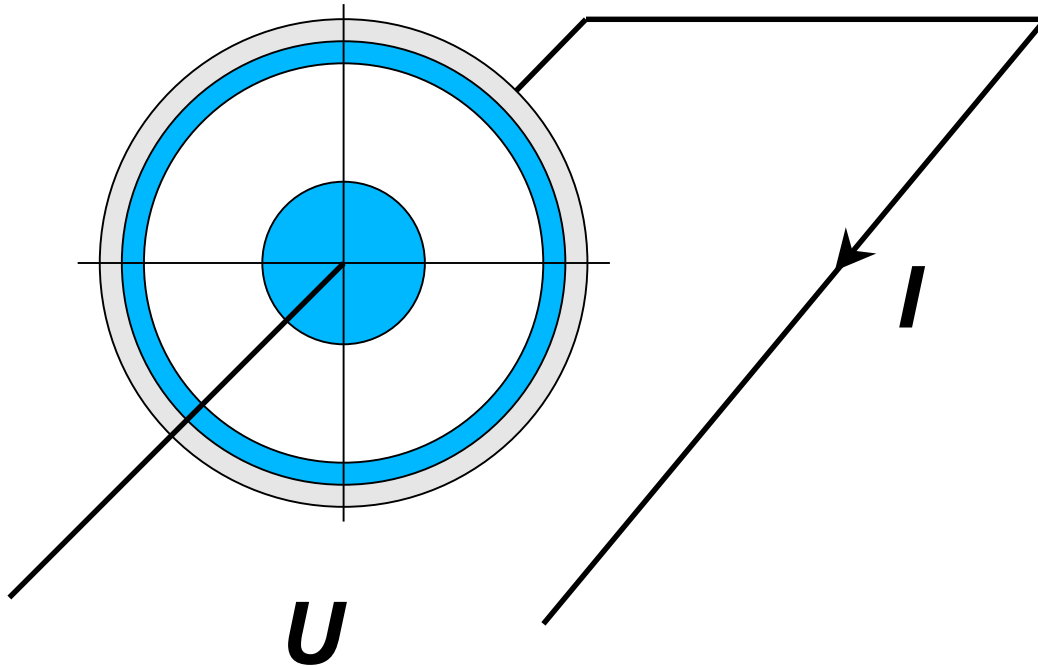
Task:

Capacitance, C [F/m]

$$q = I * t \text{ [C]}$$

$$C = q / U \text{ [F/m]}$$

Cable resistance, inductance

I

U

Problem specification:

Frequency f = 60 Hz
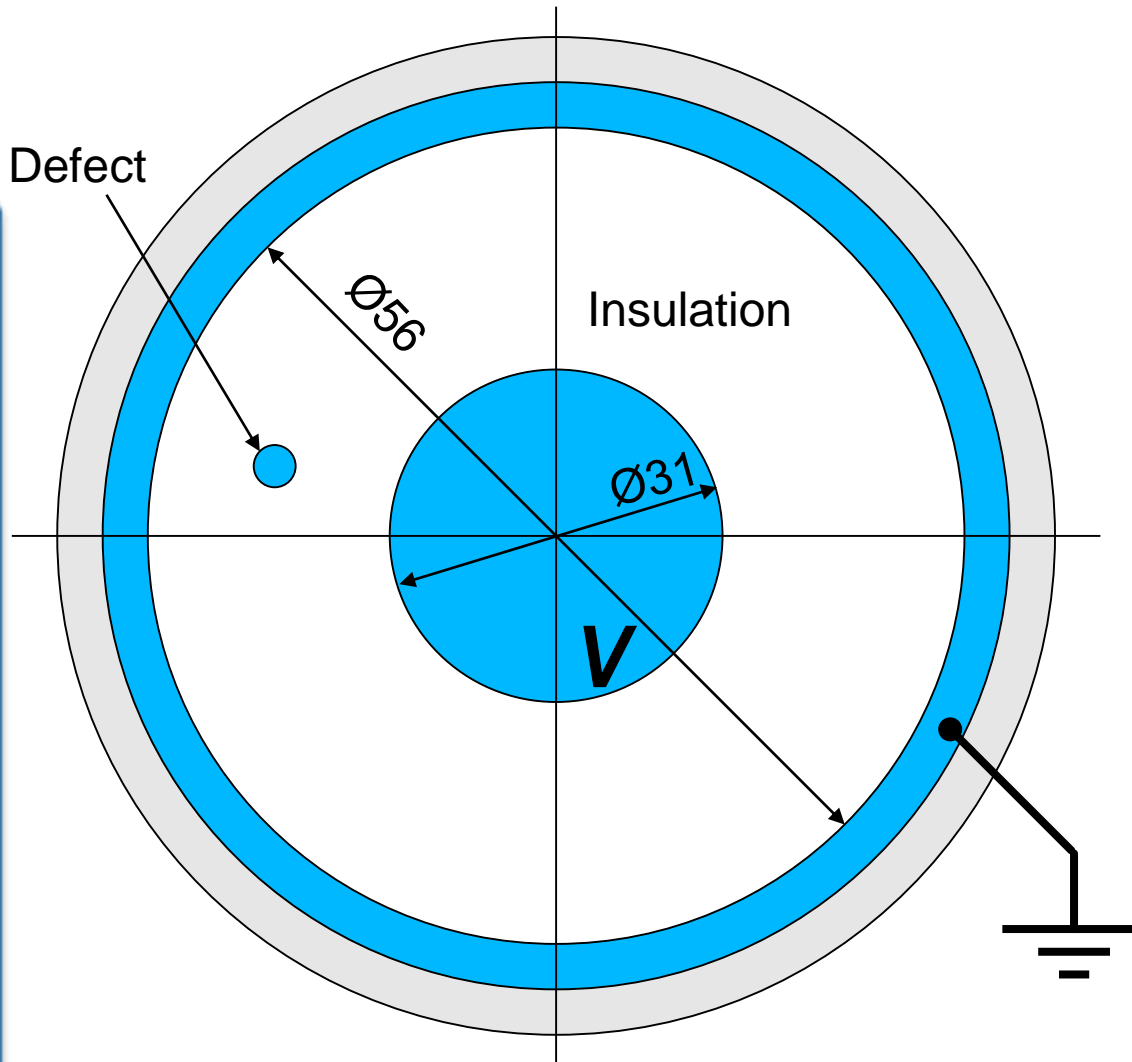Current I = 1000 A

Tasks:

Resistance DC and AC,
R_{DC}, R_{AC} [Ohm/m]
Inductance L [H/m]

$$U / I = R + i*X_L \ \text{[Ohm/m]}$$

$$L = X_L / 2\pi*f \ \text{[H/m]}$$

Cable insulation stress

Defect

Ø56

Ø31

Insulation

V

Problem specification:

Voltage V = 110 kV
Breakdown electric stress
 - air: 3 kV/mm
 - insulation: 40 kV/mm
Defect: air, conductor

Task:

Electric field stress **E** [V/m]

Stress control tube

Conductor

Screen
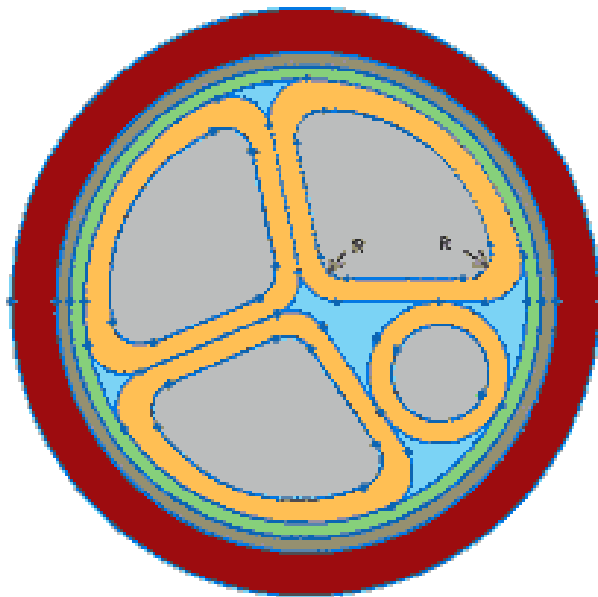
Stress
control tube
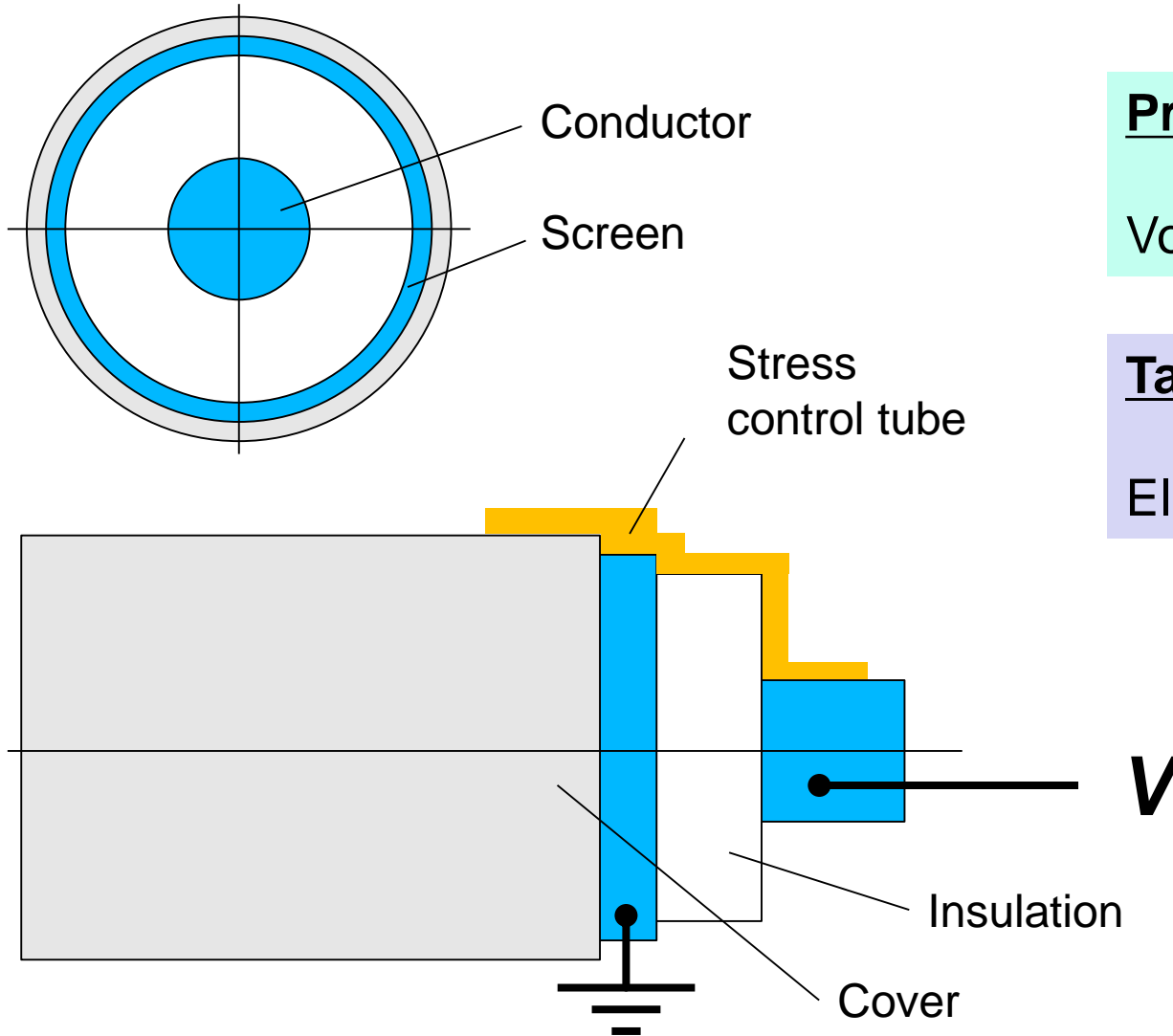
Problem specification:

Voltage $V = 110$ kV

Task:

Electric field stress

V

Insulation

Cover

Automated cable design

Conductors

Cable-core insulation

Filling insulator (air)

Inner cable insulation

Protective steel braiding

Outer cable insulation

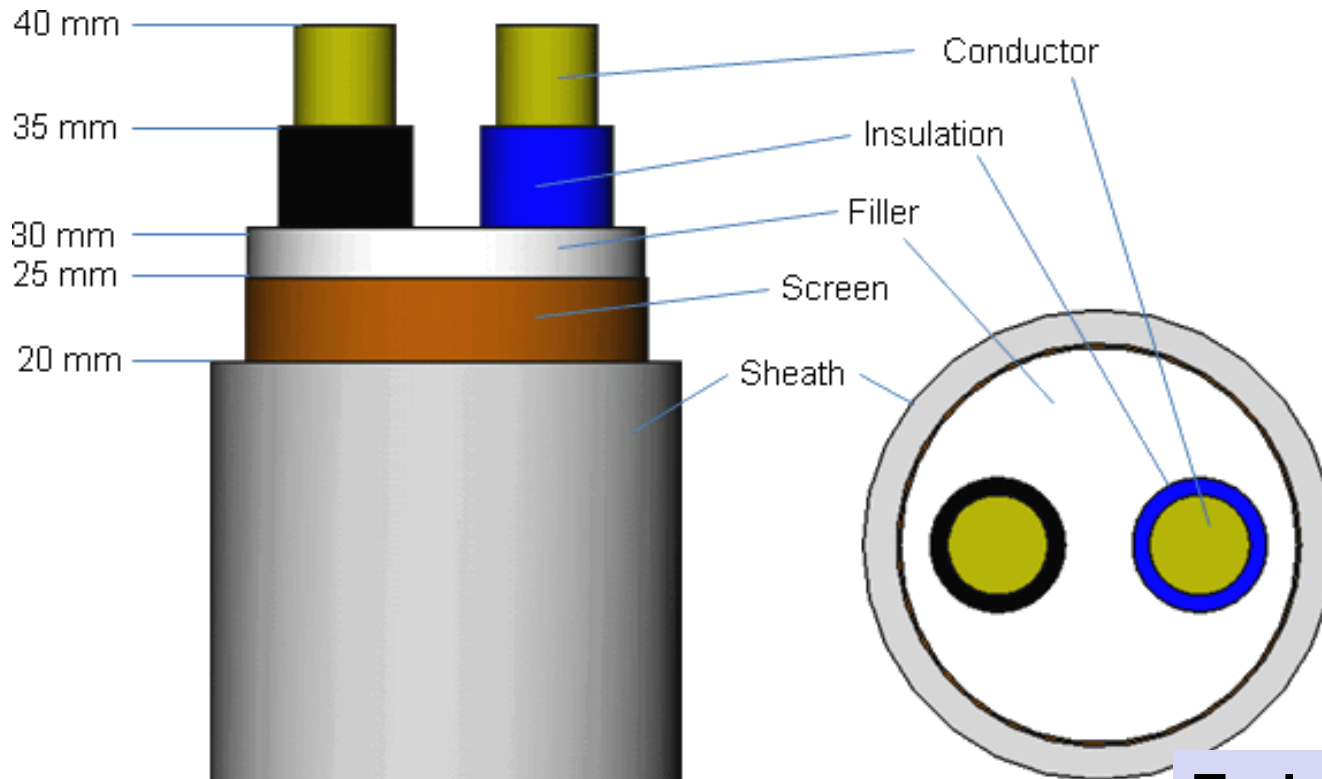**Problem specification:**

Frequency f = 60 Hz
Current I = 5.5 kA

Tasks:

Partial capacitances,
Mutual inductances,
Temperature,
Mechanical stress.

Automated cable design

40 mm
35 mm
30 mm
25 mm
20 mm

Conductor
Insulation
Filler
Screen
Sheath

Task:

Electric field stress

http://quickfield.com/advanced/cable_termination.htm