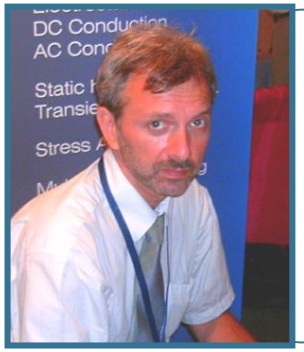
Current flow analysis with QuickField

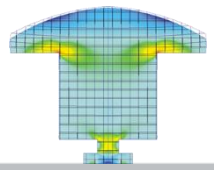
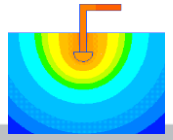
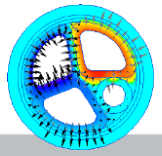
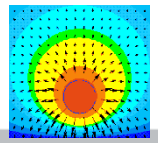
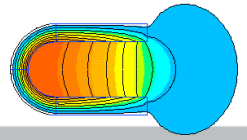
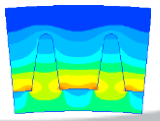
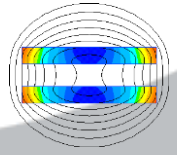
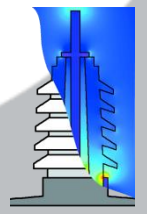


Vladimir Podnos,
Director of Marketing and Support,
Tera Analysis Ltd.

Alexander Lyubimtsev
Support Engineer
Tera Analysis Ltd.

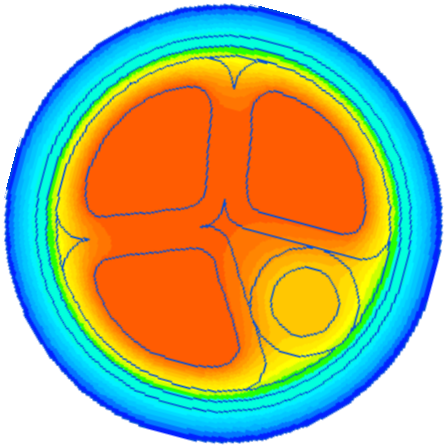
QuickField Analysis Options

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

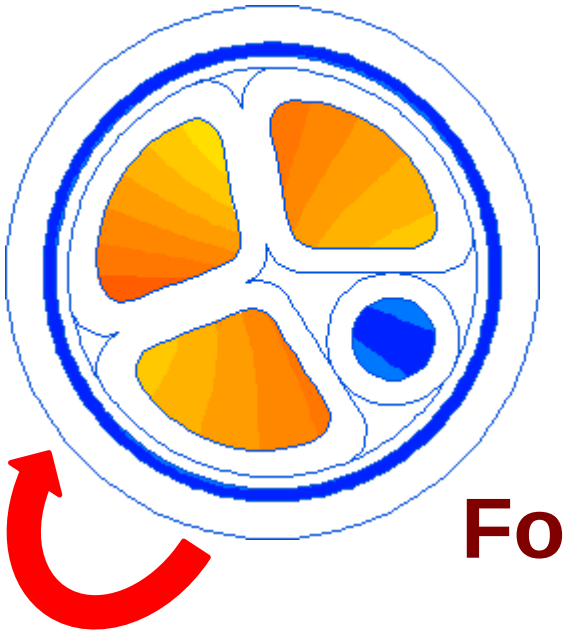









MultiPhysics.

Temperature Field

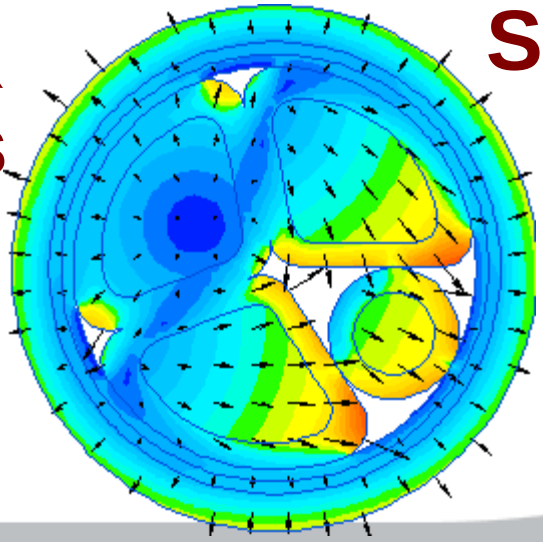


Electromagnetic fields



Thermal Stresses

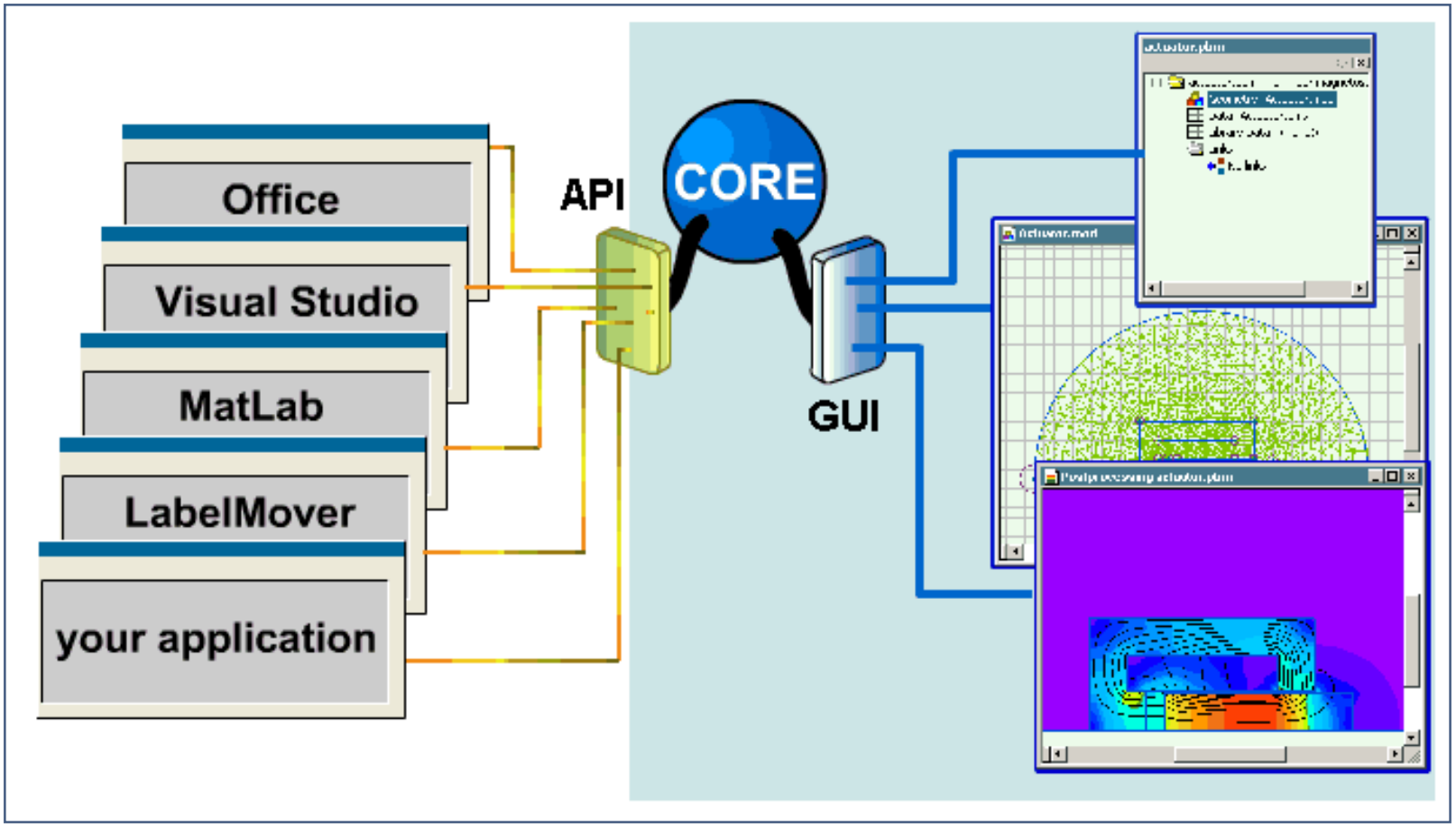
Forces



Magnetic state import

Stresses & Deformations

Open object interface

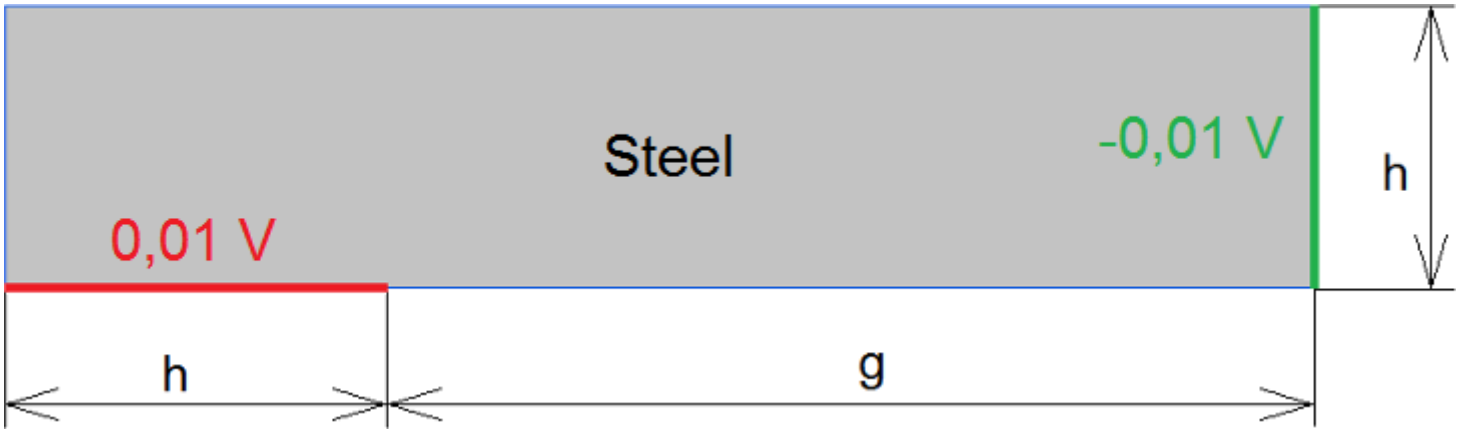


QuickField Difference

Current flow analysis with QuickField

1. Conducting plate resistance.
2. Ideal contact between two plates
3. Contact resistance
4. Ground connector.
5. Film heater
6. Leakage current. AC conduction
7. Surge current. Transient electric

Conducting plate resistance



Problem specification:

Electrical conductivity of the steel
$\gamma = 10 \cdot 10^6$ S/m,
h = 6 mm, *g* = 20 mm,
d = 1 mm - thickness of the plate

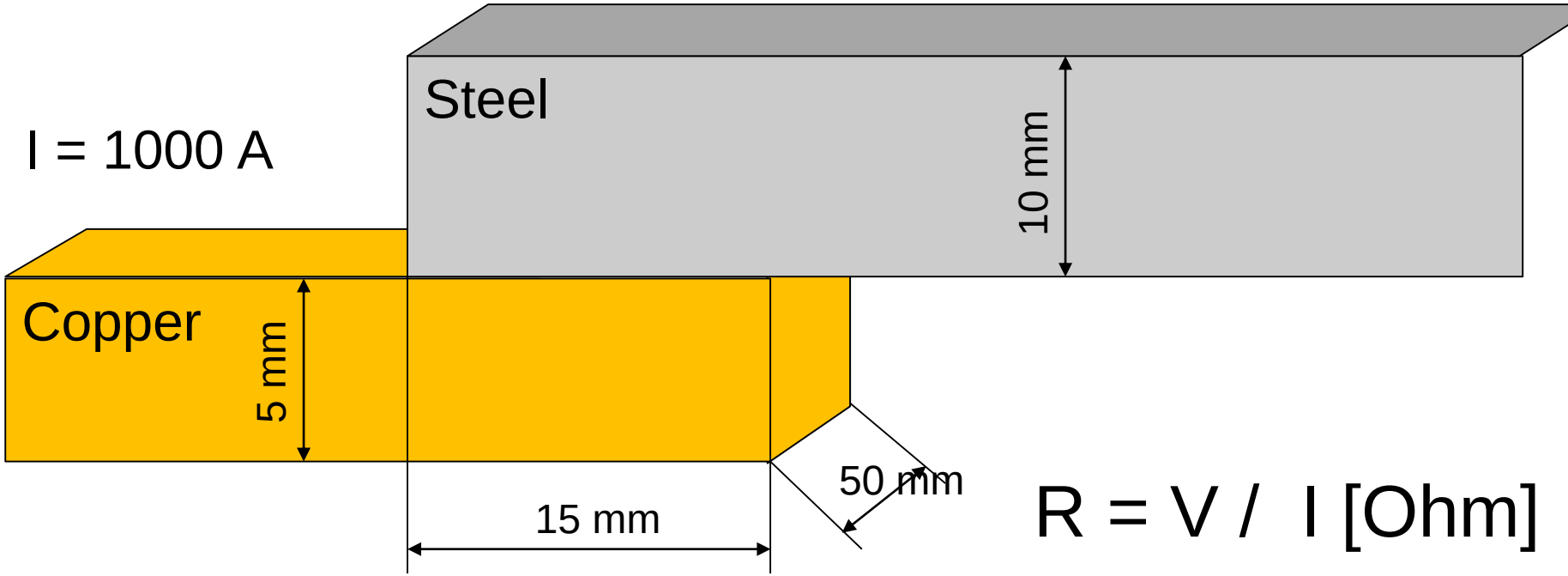
Tasks:

Calculate plate resistance

$R = \Delta V / I$ [Ohm]

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

Ideal contact between two plates



R = V / I [Ohm]

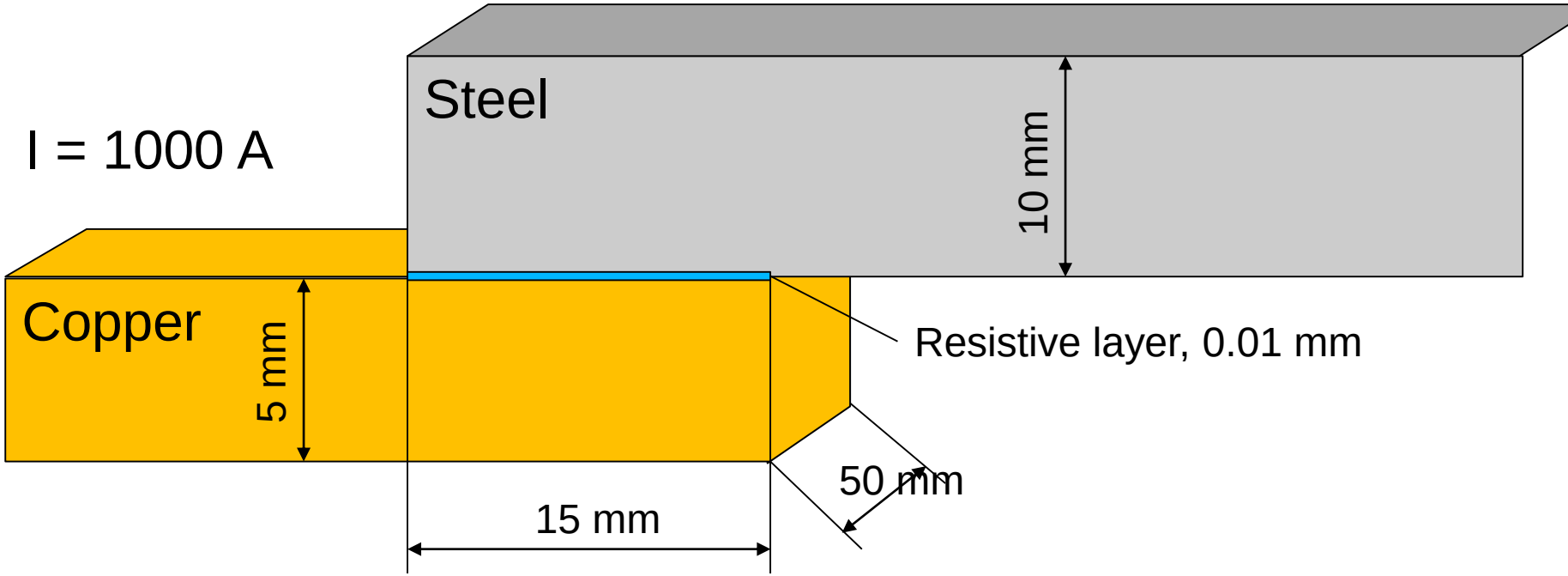
Problem specification:

Electrical conductivity
steel $\gamma = 10 \cdot 10^6$ S/m,
copper $\gamma = 56 \cdot 10^6$ S/m

Tasks:

Calculate contact resistance

Contact resistance



Problem specification:

Electrical conductivity:

steel $\gamma = 10 \cdot 10^6$ S/m,

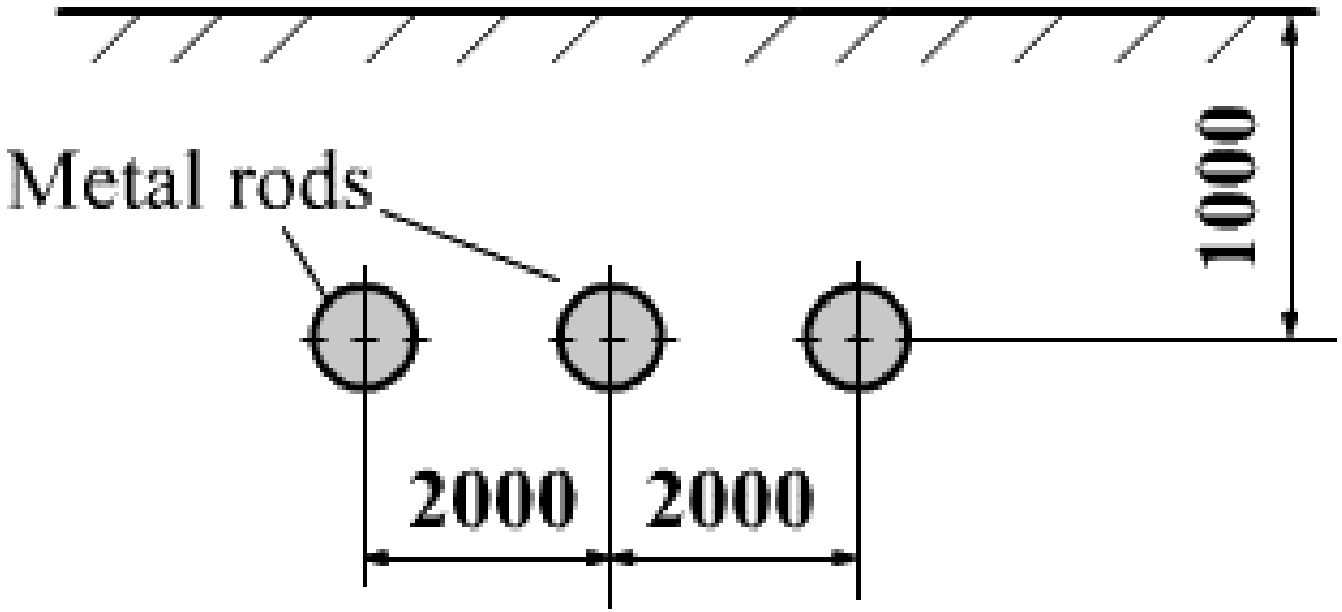
copper $\gamma = 56 \cdot 10^6$ S/m,

layer $\gamma = 0.01 \cdot 10^6$ S/m.

Tasks:

Calculate contact resistance, heat losses.

Ground connector



Problem specification:

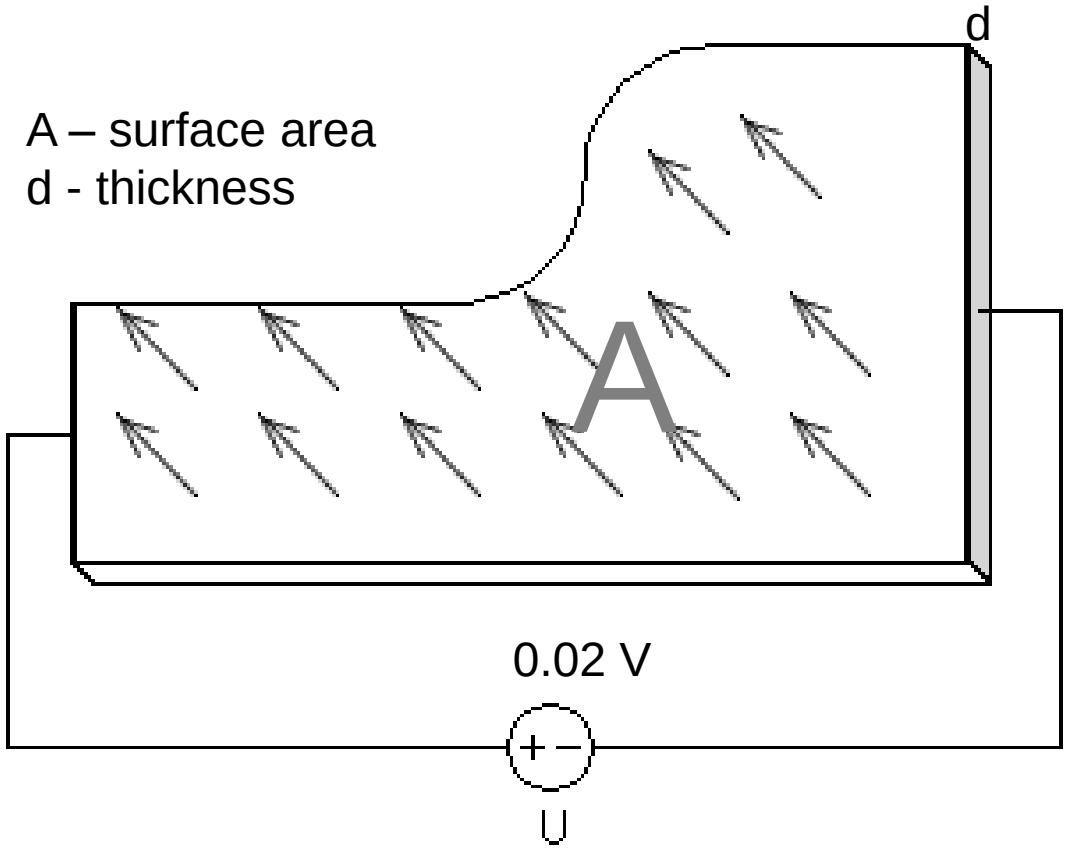
Soil electrical conductivity γ = 0.1 S/m
Voltage V = 220 V (RMS)
Rod diameter 4 cm, length 4 m.

Tasks:

Required grounding resistance R= 4 Ohm

http://quickfield.com/advanced/ground-connector.htm

Film heater



Problem specification:

Electrical conductivity
$\gamma = 10 \cdot 10^6$ S/m
Thermal conductivity
$\lambda = 380$ W/K·m;
Convection coefficient
$\alpha = 10$ W/K·m^2;
Ambient air temperature
$T_0 = 0^\circ$ C.

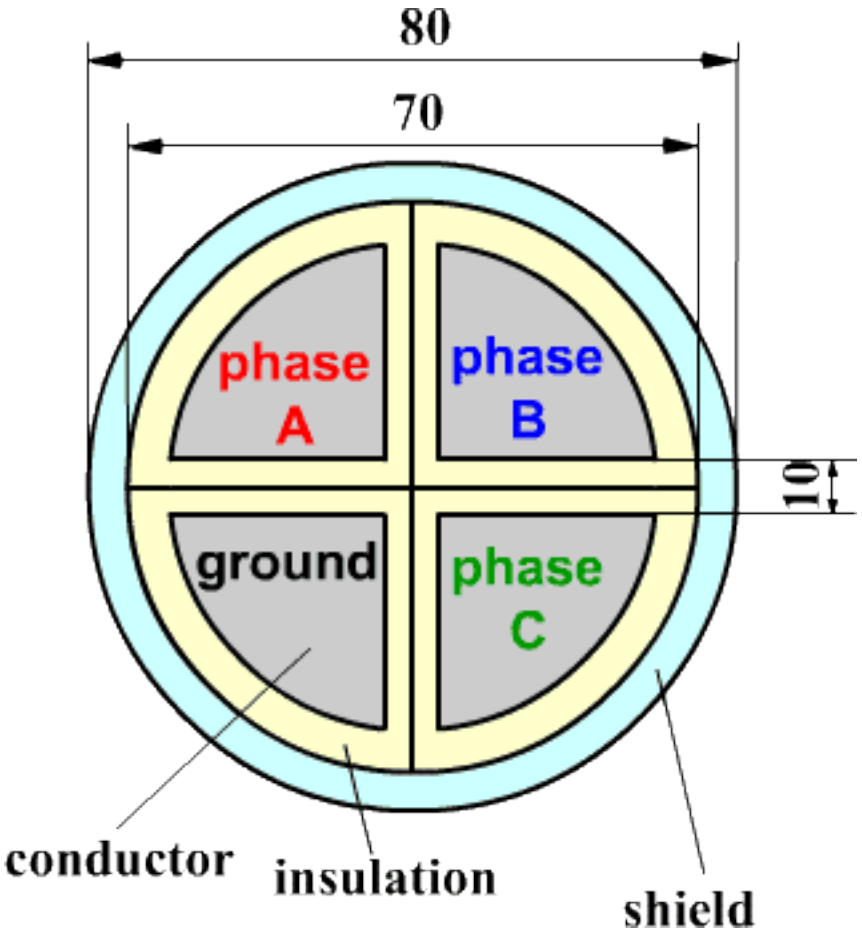
Convection Q = $\alpha \cdot T \cdot (2A)$ [W]
Heat sink Q = - $k \cdot T \cdot (A \cdot d)$ [W]

Tasks:

Resistance, temperature

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

Leakage current. AC conduction



Problem specification:

Phase voltage V= 250 V (RMS)

Frequency *f* = 400 Hz

Insulation electrical conductivity γ = 0.1 uS/m

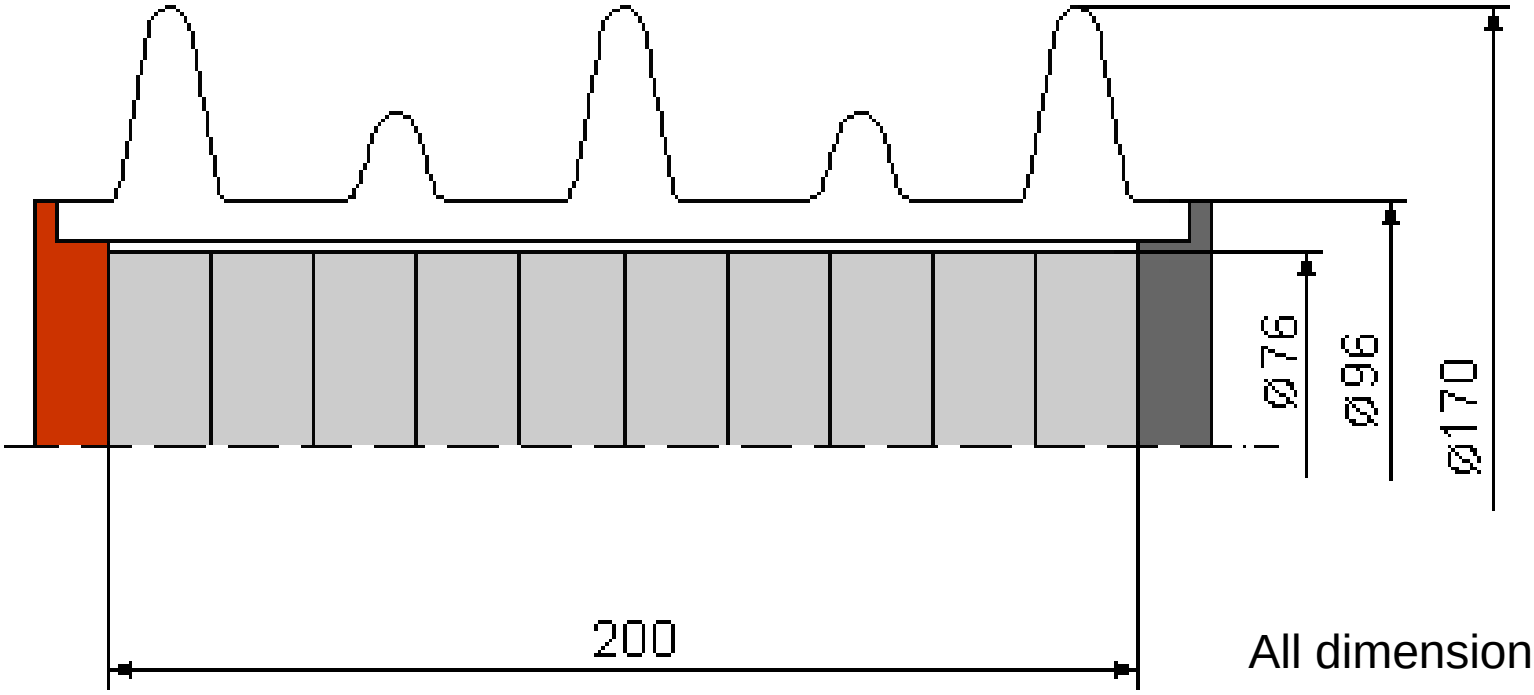
Insulation relative permittivity ε = 2

Tasks:

Power loss in dielectric

http://quickfield.com/advanced/3-phase-cable.htm

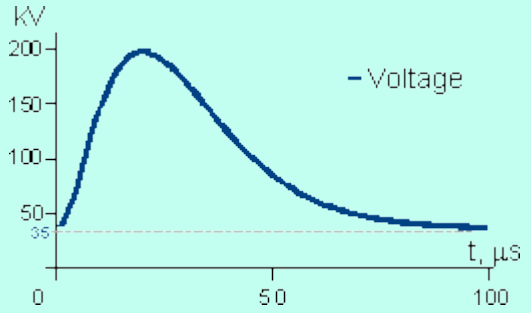
Surge current. Transient electric



All dimensions are in mm.

Problem specification:

Rate voltage U = 35 kV
Zn0 permittivity ε = 60
Zn0 conductivity $\sigma = \sigma(E)$



Tasks:

Active current

http://quickfield.com/advanced/telec2.htm