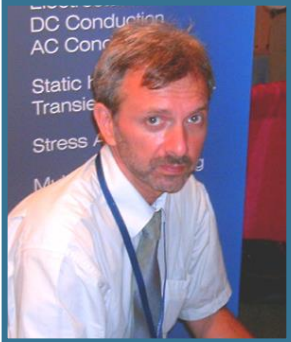# Eddy currents simulation with QuickField

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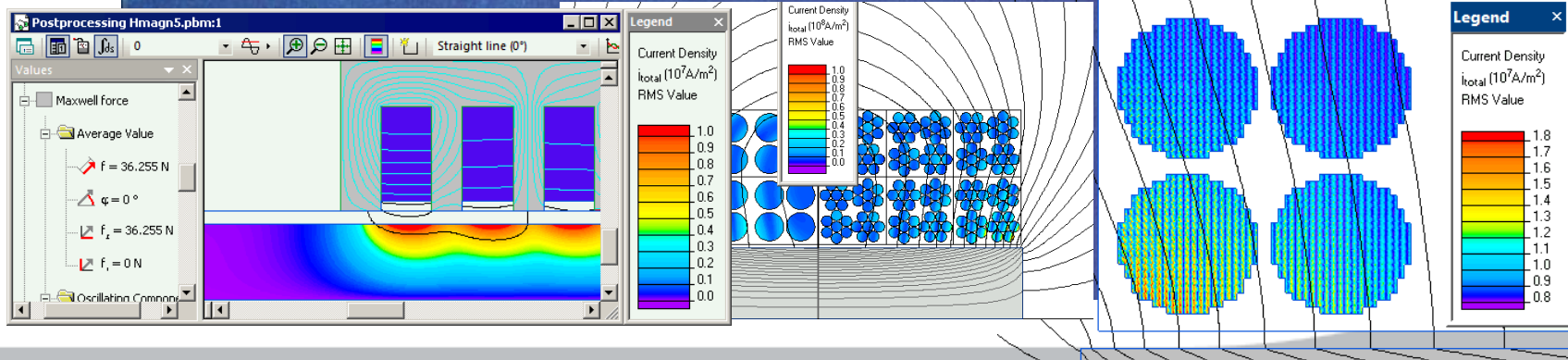*Introduction*

Alexander Lyubimtsev
Support Engineer
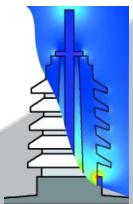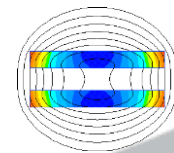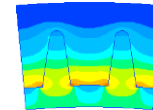**Tera Analysis Ltd.**
Live demonstration

Eddy currents

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)

Temperature field

Electromagnetic fields

Losses

Temperature field import

Thermal Stresses

Forces

Magnetic state import

Stresses & Deformations
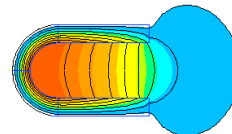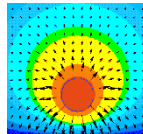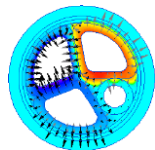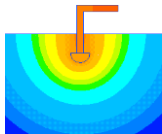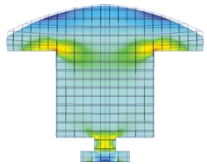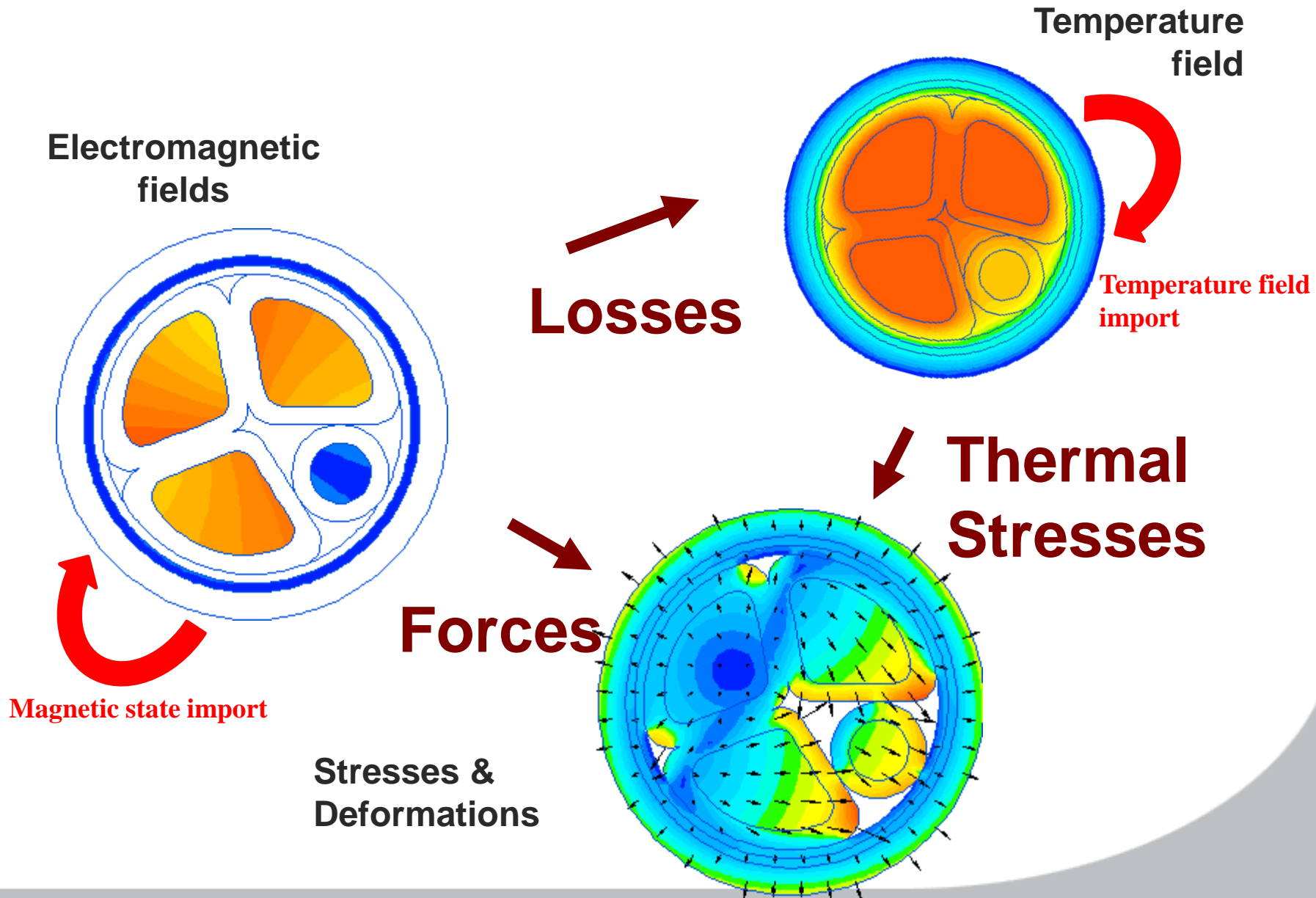
MultiPhysics (2D)

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

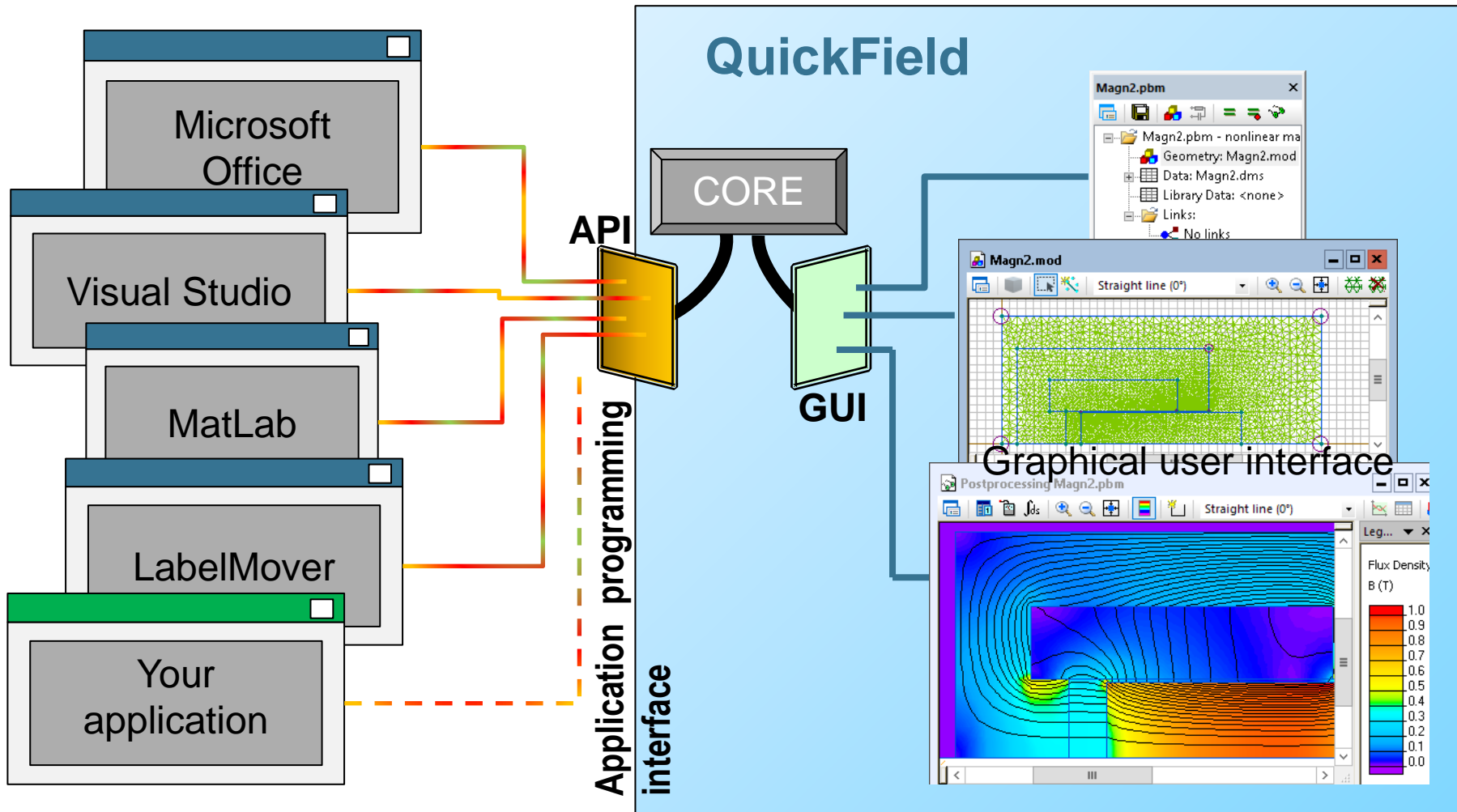| Destination: / Source:	DC magnetics	AC magnetics	Transient magnetics	Static heat transfer	Transient heat transfer	Stress Analysis
DC magnetics	Magnetic permeability	Magnetic permeability	Initial magnetic field			Force
AC magnetics				Joule heat	Joule heat	Force
Transient magnetics			Initial magnetic 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						

https://quickfield.com/coupling.htm

Open object interface

QuickField

CORE

GUI

API

Application programming interface

Graphical user interface

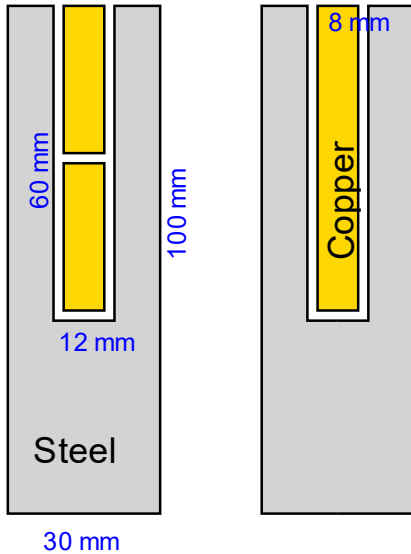Microsoft Office

Visual Studio

MatLab

LabelMover

Your application

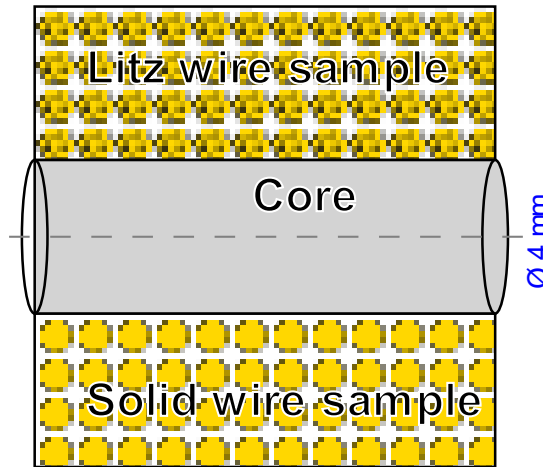# QuickField Difference

Eddy currents simulation with QuickField

60 mm

100 mm

12 mm

8 mm

Copper

Steel

30 mm

Slot embedded conductor skin effect

D30

b

O

a

Copper

Air

128

Proximity effect

Litz wire sample

Core

Ø 4 mm

Solid wire sample
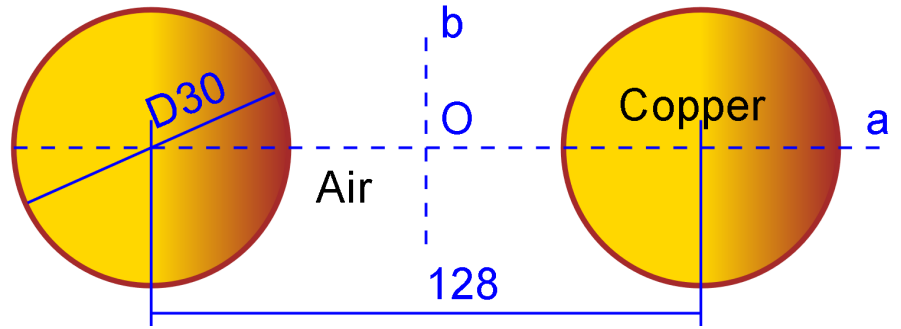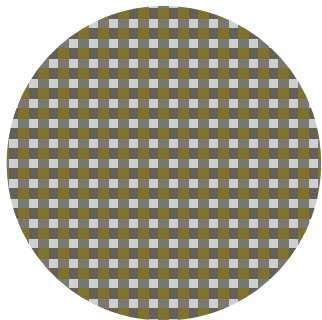
Stranded wire

Litz wire losses

5.8 mm

Steel core

Ceramic tube

Winding

Liquid metal
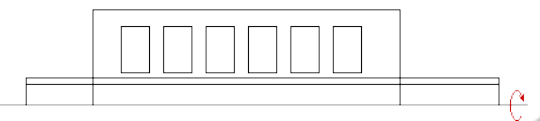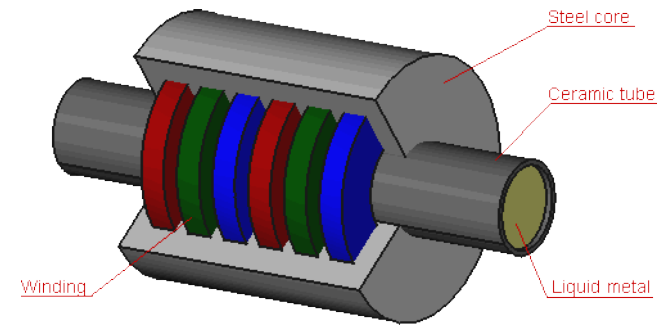
Induction pump

Slot embedded conductor skin effect
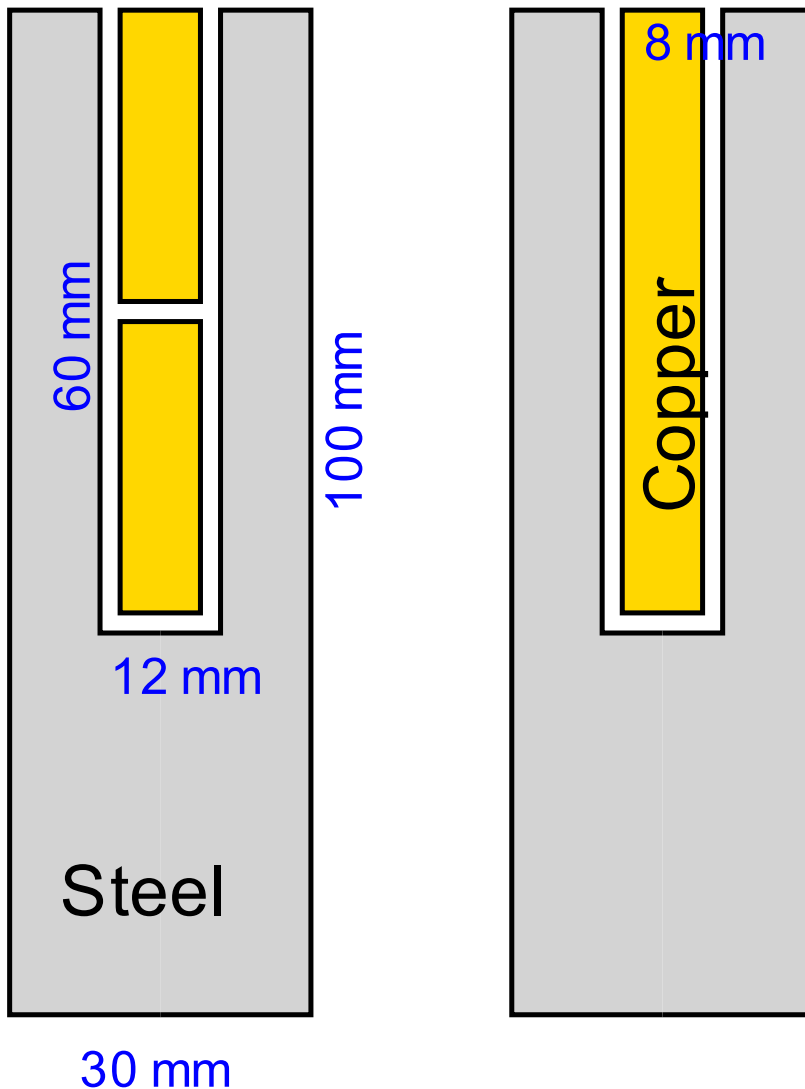
60 mm
100 mm
12 mm
Steel
30 mm
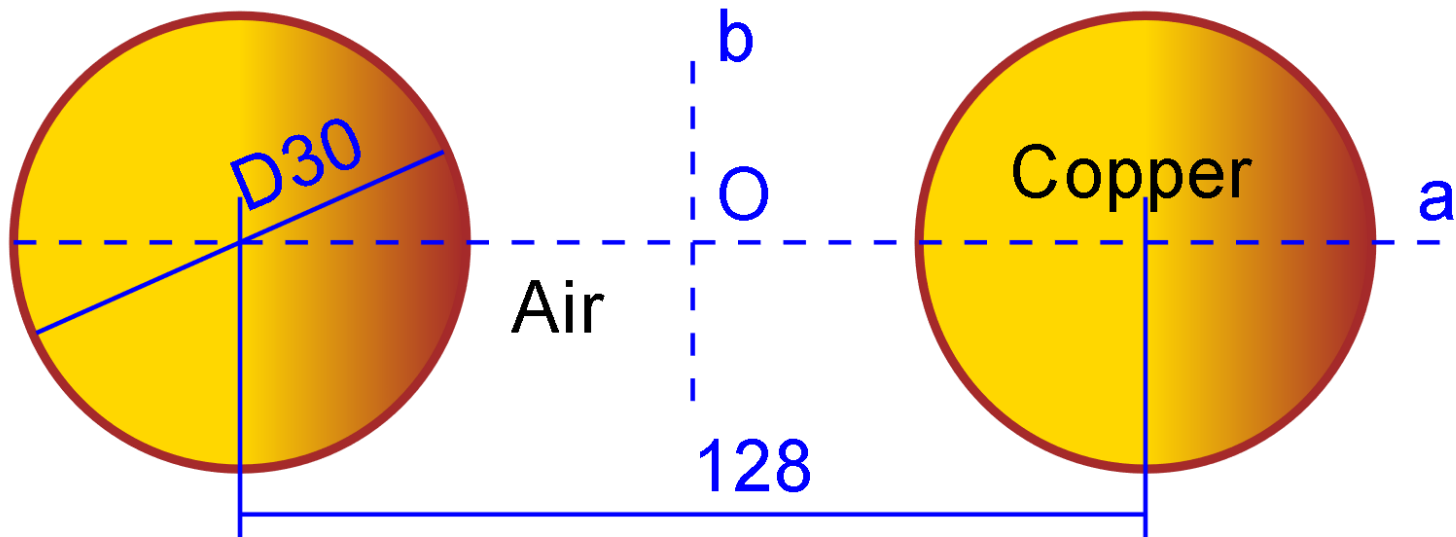
8 mm
Copper

Problem specification:
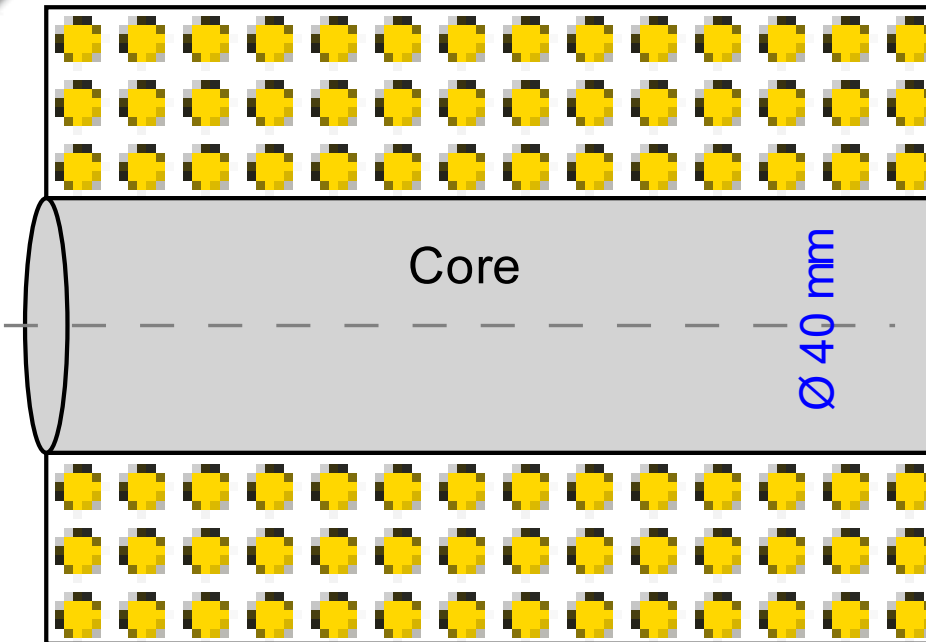
Ampere-turns in the coil I = 750 A
Steel magnetic permeability = 2000

Task:

Determine the dependence of the attraction force on the distance between the rotor and the electromagnet.

Proximity effect

Task:

Determine the dependence of the attraction force on the distance between the rotor and the electromagnet.

Problem specification:

Ampere-turns in the coil I = 750 A
Steel magnetic permeability = 2000

Stranded wire

Core

Ø 40 mm

Problem specification:

Conductor current
I = 1 A (magnitude)

Frequency f = 50 kHz

Ferrite magnetic
permeability = 500

277 strands

Stranded

wire

Task:

Calculate Joule losses in the
stranded wire winding.

Litz wire losses

Litz wire sample

Core

Solid wire sample

Ø 4 mm

5.8 mm

Problem specification:

Ampere-turns in the coil I = 750 A
Steel magnetic permeability = 2000

Task:

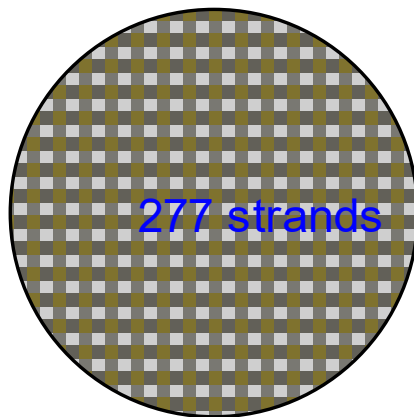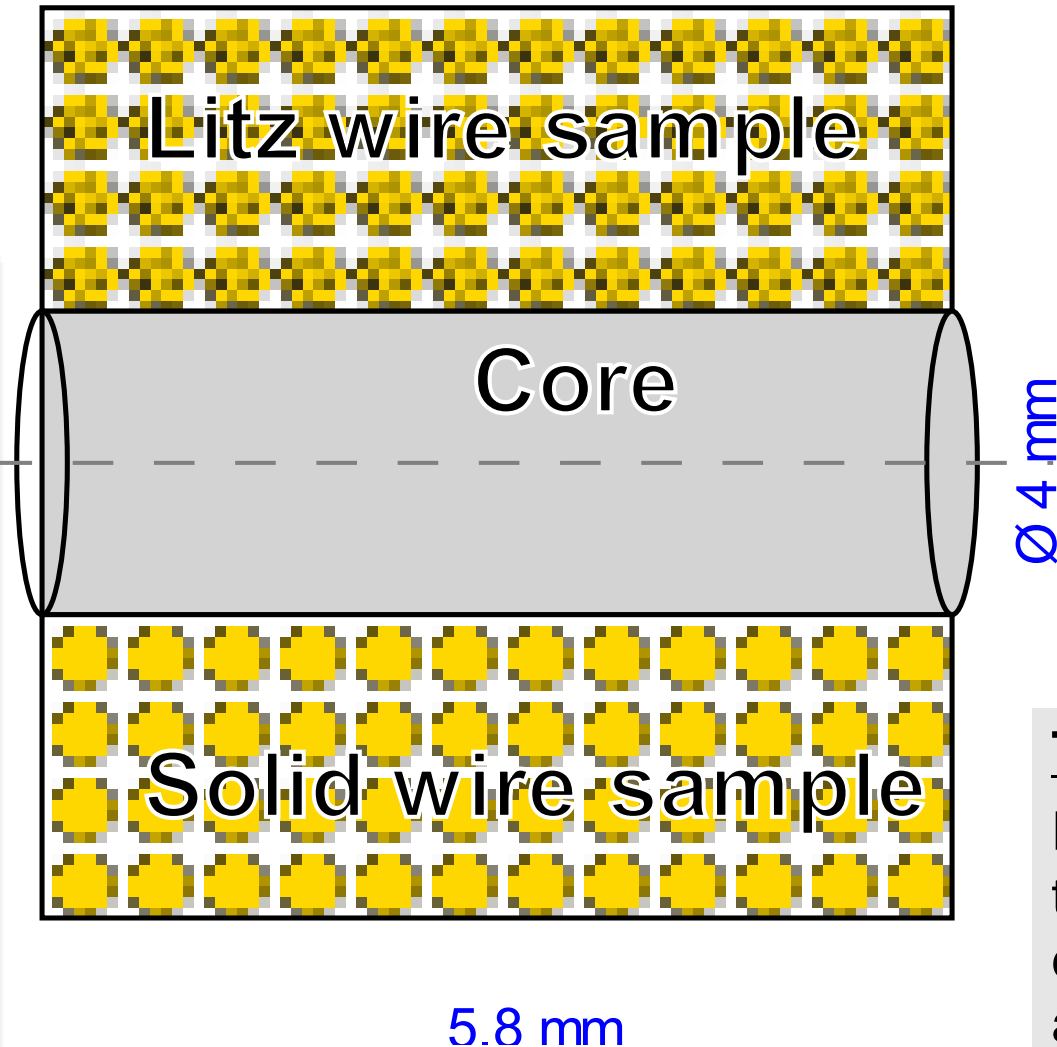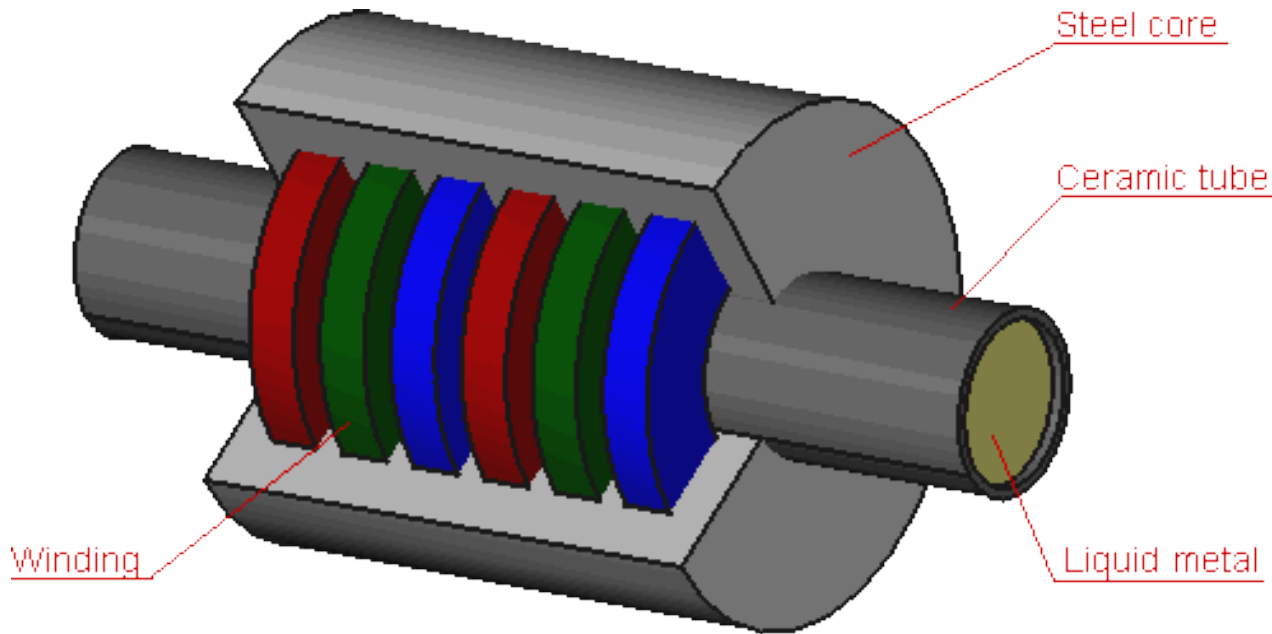Determine the dependence of the attraction force on the distance between the rotor and the electromagnet.

Induction pump

Steel core

Ceramic tube

Winding

Liquid metal

Problem specification:

Coil ampere-turns I = 750 A
Steel magnetic permeability = 2000

Task:

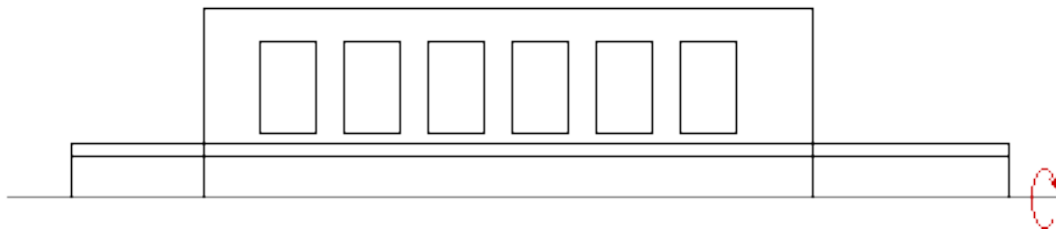Determine the dependence of the attraction force on the distance between the rotor and the electromagnet.