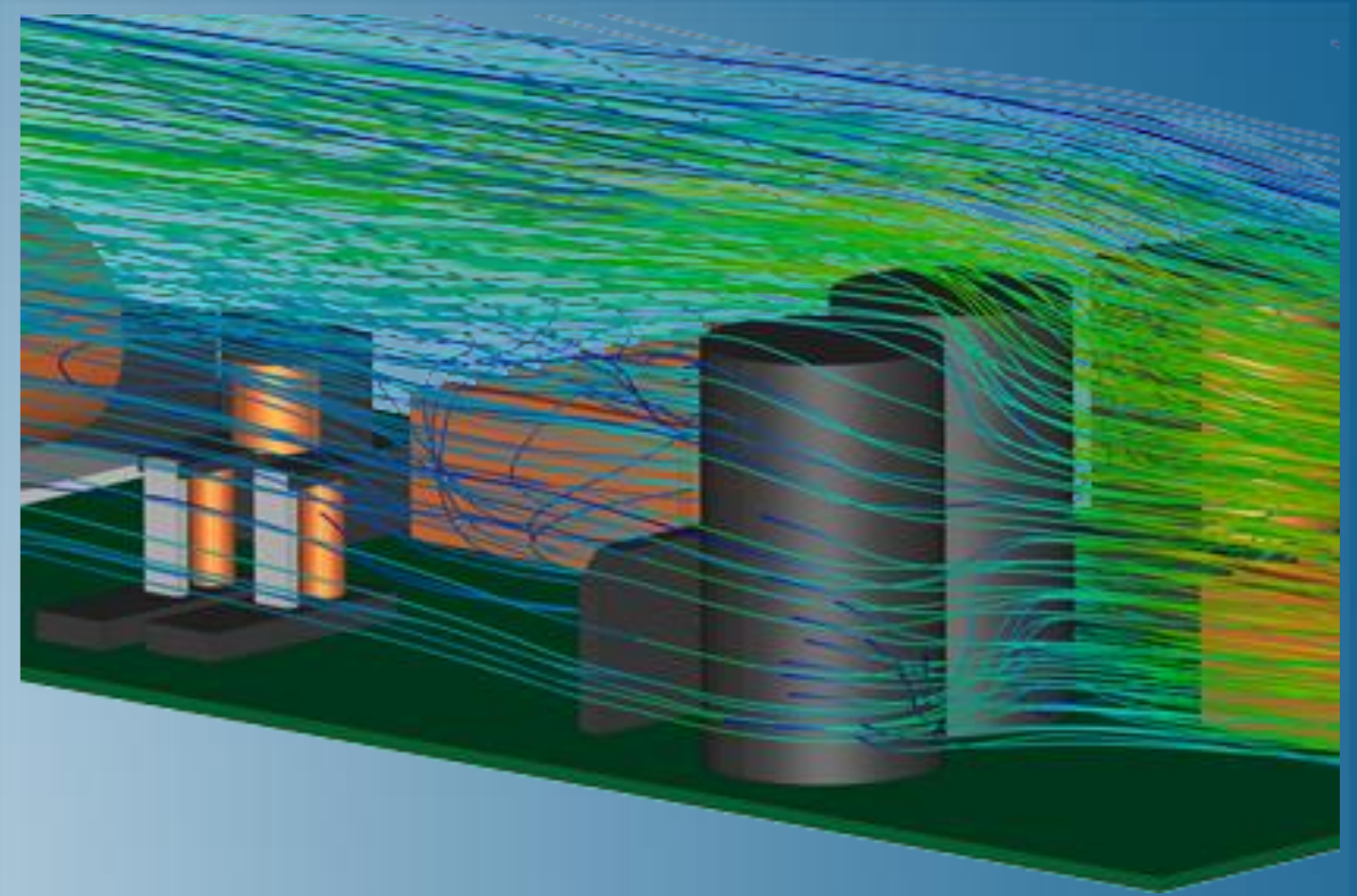


CST Studio Suite - Multiphysics

2020



3DEXPERIENCE[®]



About this Course

Course objectives

Upon completion of the course you will:

- Understand basic thermal and mechanical theories

- Get an overview of CST's Multiphysics Studio's capabilities

- Understand basic sources, boundary conditions, meshing options and solver options in CST Multiphysics Studio

- Be able to run an EM-Thermal-Mechanical coupled analysis

Targeted audience

Recommended for Electromagnetic Simulation Analysts who also need thermal and mechanical analysis as part of their workflow

Prerequisites

Introduction to CST Studio Suite



1 day

Why Multiphysics?

- ▶ Many engineering problems involve multiple physics domains. For example, designing a printed circuit board requires careful consideration of the physics of the electromagnetic, thermal, fluid, and solid responses.
- ▶ Traditionally, simulations of these physics are handled by different software from different vendors. The communication between the physics are rather manual and prone to error. CST Multiphysics Studio allows the same user interface for electromagnetics, thermal-fluid, and mechanical simulations, and the links between various physics are handled internally, ensuring a consistent user experience and accurate information transfer.
- ▶ This course offers an introduction on how to use this powerful tool.

Day 1

- ▶ Lesson 1 Basic Principles and Solver Choices
- ▶ Lesson 2 The "Classic" Solvers THs and THt
- ▶ Lesson 3 The Conjugate Heat Transfer Solver
- ▶ Lesson 4 Thermal Sources, Drains and EM-Thermal Links
- ▶ Lesson 5 Structure Mechanics Solver

- ▶ Workshop 1 Predicting Temperature of a Simplified Tablet
- ▶ Workshop 2 Heating a Moving Metal Rod
- ▶ Workshop 3 Power Supply Card
- ▶ Workshop 4 Coupled EM-CHT Simulation
- ▶ Workshop 5 Coupled Simulation



During the course 2 or 3 workshops will be selected depending on the student's background

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The screenshot shows the SIMULIA Services Training Courses page. At the top, there is a navigation menu with the following items: PRODUCTS & SERVICES, SIMULIA, SERVICES, TRAINING COURSES, and SCHEDULE & REGISTRATION. Below the navigation, the main heading is "SIMULIA SERVICES" with the subtext "PROVIDING HIGH QUALITY SIMULATION AND TRAINING SERVICES TO ENABLE OUR CUSTOMERS TO BE MORE PRODUCTIVE AND COMPETITIVE." A teal button labeled "CONTACT SALES" with an envelope icon is positioned in the top right corner. The main content area is titled "Training Schedule & Registration" and contains a paragraph: "We offer regularly scheduled public seminars as well as training courses at customer sites. An extensive range of courses are available, ranging from basic introductions to advanced courses that cover specific analysis topics and applications. On-site courses can be customized to focus on topics of particular interest to the customer, based on the customer's prior specification. To view the worldwide course schedule and to register for a course, visit the links below." Below this text are three columns of links. The first column, "North American", features a map of North America and links for "By Location" and "By Course". The second column, "International", features a globe and links for "By Location" and "By Course". The third column, "Live Online Training", features a computer monitor with a glowing screen and a link for "Full Schedule".

PRODUCTS & SERVICES ▾ SIMULIA ▾ SERVICES ▾ TRAINING COURSES ▾ SCHEDULE & REGISTRATION ▾

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Training Schedule & Registration


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North American




- > [By Location](#)
- > [By Course](#)

International



- > [By Location](#)
- > [By Course](#)

Live Online Training



- > [Full Schedule](#)

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Revision Status

Lesson 1	1/20	Updated for CST Studio 2020
Lesson 2	1/20	Updated for CST Studio 2020
Lesson 3	1/20	Updated for CST Studio 2020
Lesson 4	1/20	Updated for CST Studio 2020
Lesson 5	1/20	Updated for CST Studio 2020
Workshop 1	1/20	Updated for CST Studio 2020
Workshop 2	1/20	Updated for CST Studio 2020
Workshop 3	1/20	Updated for CST Studio 2020
Workshop 4	1/20	Updated for CST Studio 2020
Workshop 5	1/20	Updated for CST Studio 2020

Lesson 1: Basic Principles and Solver Choices

Lesson content:

- ▶ Introduction
- ▶ Basic Heat Transfer Principles
 - ▣ Conduction
 - ▣ Convection
 - ▣ Radiation
 - ▣ Putting it all together (Example)
- ▶ Basic Structural Mechanics Principles
- ▶ Mechanical Properties and Loads
- ▶ CST Multiphysics Studio (MPS) Solvers



30 minutes



Lesson content:

- ▶ Introduction
- ▶ The Stationary Thermal Solver
- ▶ The Transient Thermal Solver
- ▶ Thermal Surface Properties
- ▶ Thermal Boundary Conditions
- ▶ Thermal Material Properties
- ▶ Contact Properties
- ▶ Moving Media
- ▶ Heat Transfer Coefficient Calculation
- ▶ Bio-Thermal Simulation



45 minutes

Lesson 3: The Conjugate Heat Transfer Solver

Lesson content:

- ▶ Introduction
- ▶ Conjugate Heat Transfer (CHT) Solver Overview
- ▶ Boundary Conditions
- ▶ Meshing
- ▶ Modeling Flow
- ▶ Solver Settings
- ▶ Solution Monitors
- ▶ Postprocessing



1 hour

Lesson content:

- ▶ Introduction
- ▶ Heat Sources and Drains
- ▶ EM-Thermal Links
- ▶ Types of Links
- ▶ Manual Setup
- ▶ Linking Different Project Types
- ▶ EDA Import Features



60 minutes

Lesson 5: Structure Mechanics Solver

Lesson content:

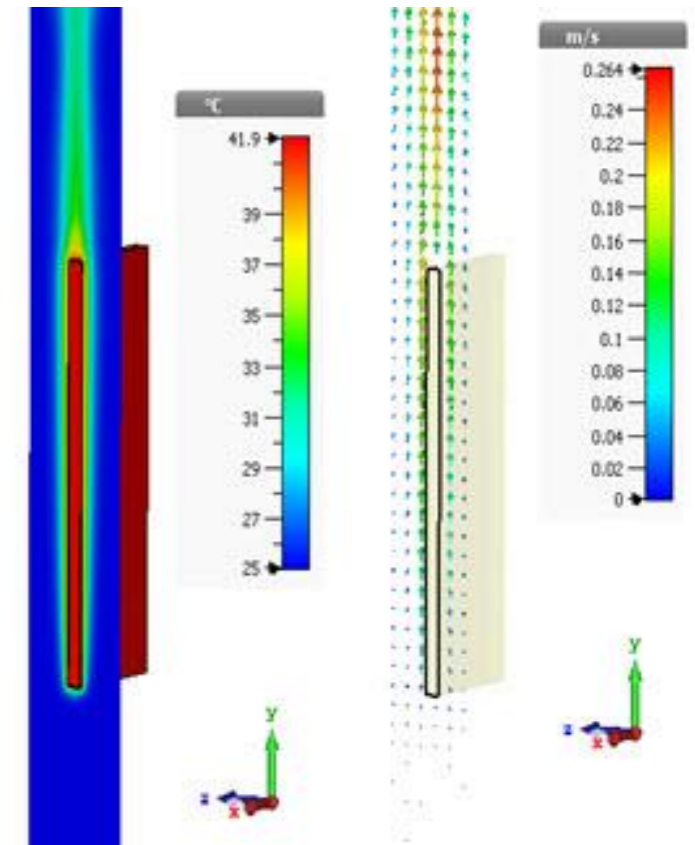
- ▶ Introduction
- ▶ Material Properties
- ▶ Modeling Stress and Deformation
 - ▣ Boundaries
 - ▣ Loads
 - ▣ Special Settings



30 minutes

Workshop 1: Predicting Temperature of a Simplified Tablet

- In this workshop, you will create a simplified tablet model and predict its surface temperature
- The tablet model illustrates how the three modes of heat transfer work together
 - We will use both the Classic thermal solver and the CHT solver to predict the surface temperature
 - We will also examine the contribution of convection and radiation to overall heat transfer

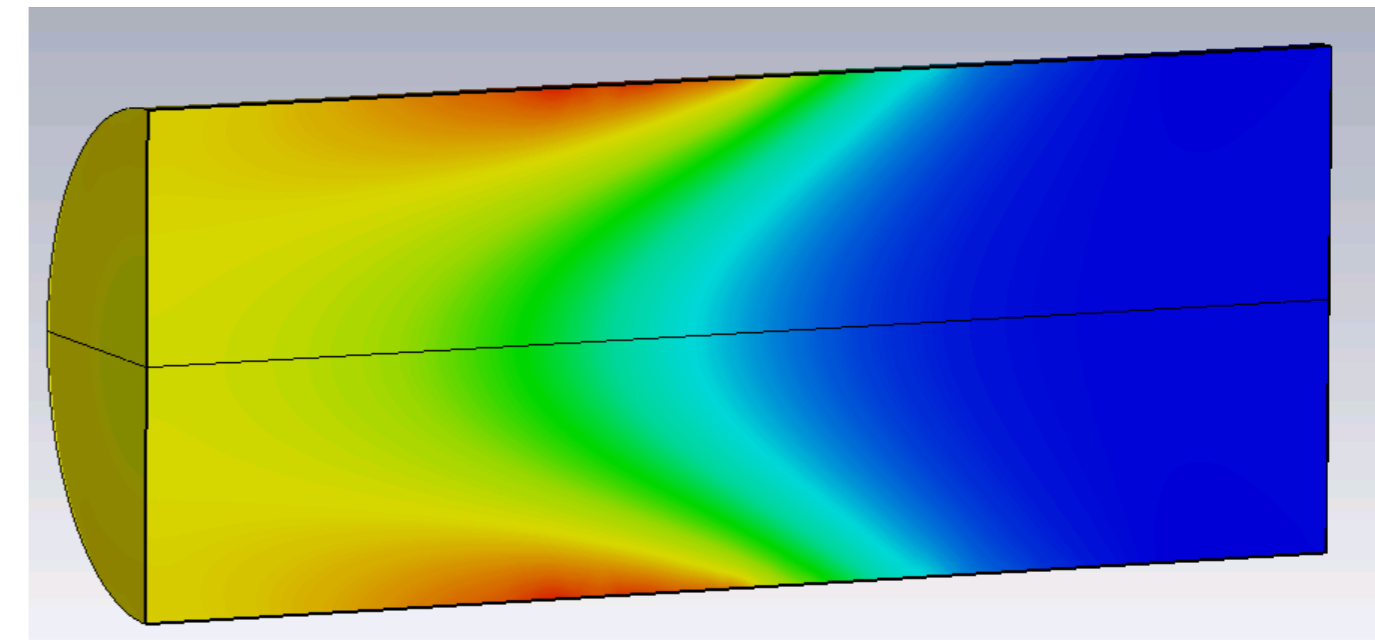


45 minutes

Workshop 2: Heating a Moving Metal Rod

In this workshop, you will create an EM-Thermal linked simulation

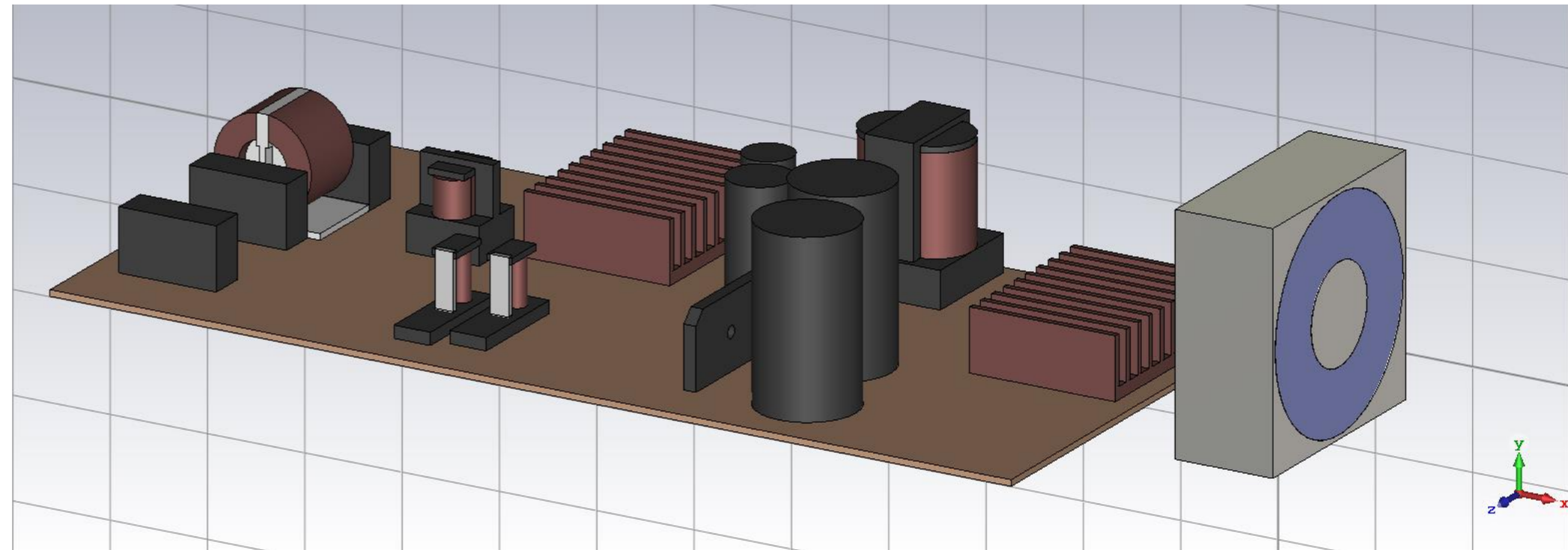
- a. The EM portion will be an induction heater
- b. The thermal portion will be a simulation of the metal being heated by the inductor as it moves 1 m/s in the +Z-direction



20 minutes

Workshop 3: Power Supply Card

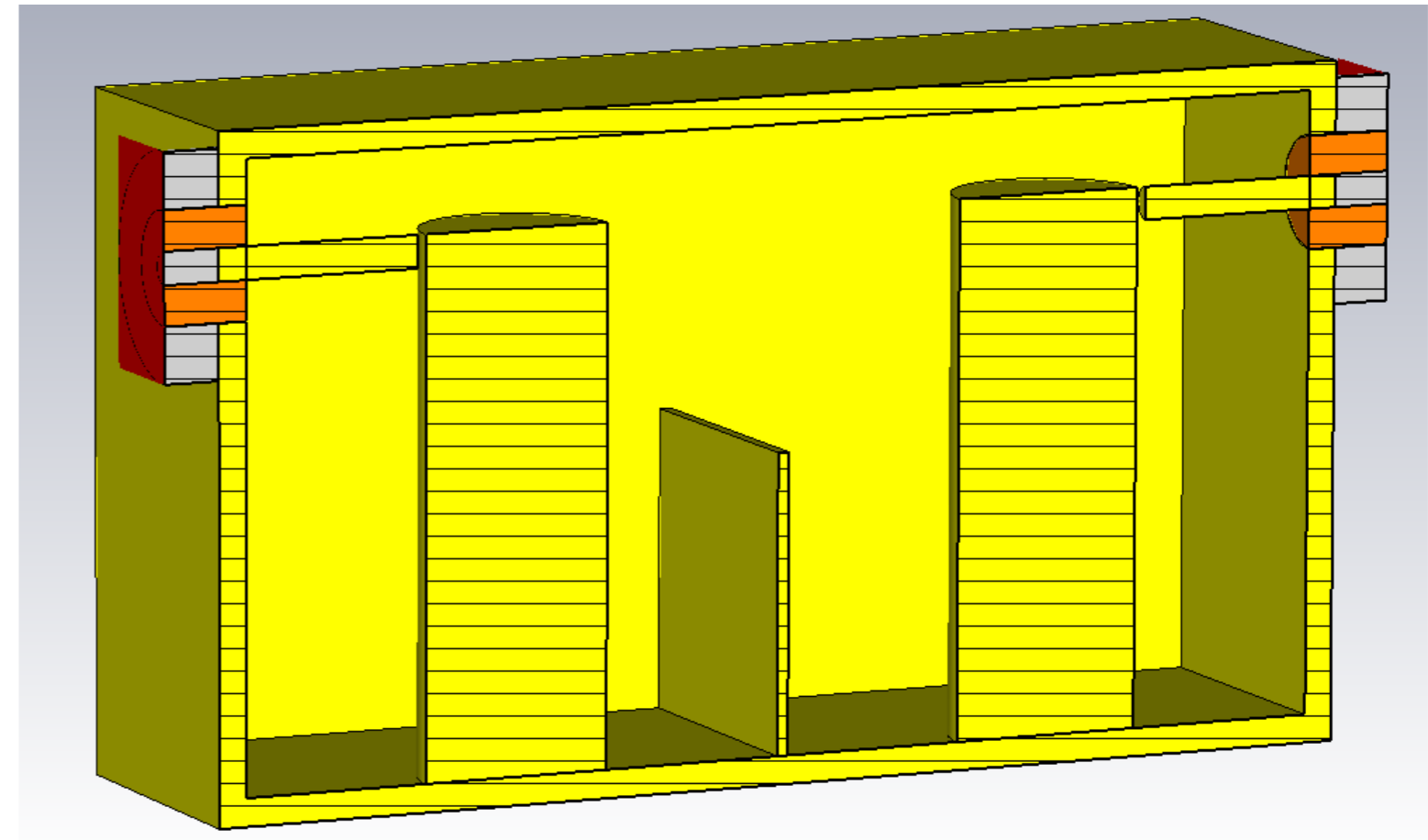
1. In this workshop you will:
 - a. Import a PCB
 - b. Set up a fan object
 - c. Set up a conjugated heat transfer simulation
 - d. Learn about meshing in CHT
 - e. Analyze the results with monitors



45 minutes

Workshop 4: Coupled EM-CHT Simulation

1. Access a component from the component library
2. Set up a coupled simulation
3. Define CHT domain and solver parameters
4. Run a coupled simulation
5. Postprocess the results

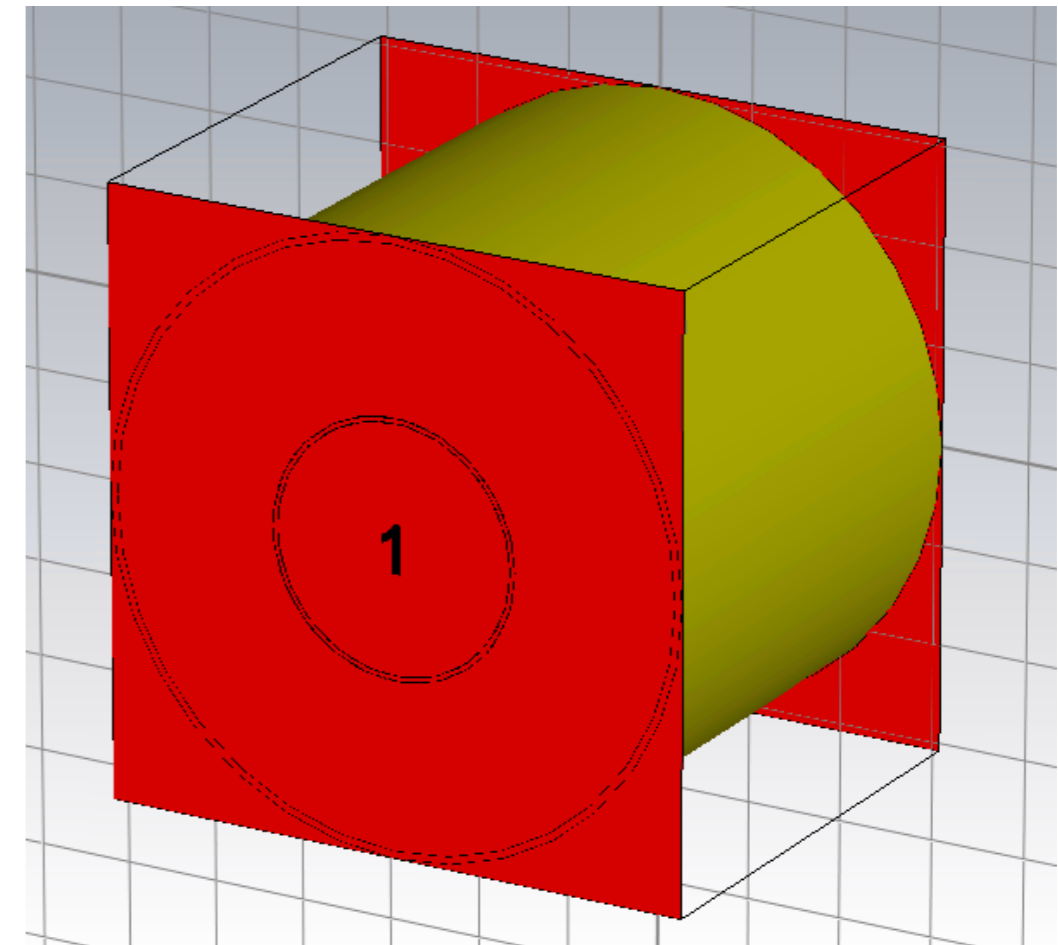


45 minutes

Workshop 5: Coupled Simulation

In this workshop you will create a study of a coax as it undergoes different physical conditions

- a. EM Frequency Domain
- b. Thermal Simulation
- c. Structural Mechanics
- d. EM Frequency Domain



45 minutes