MAGNETISiM

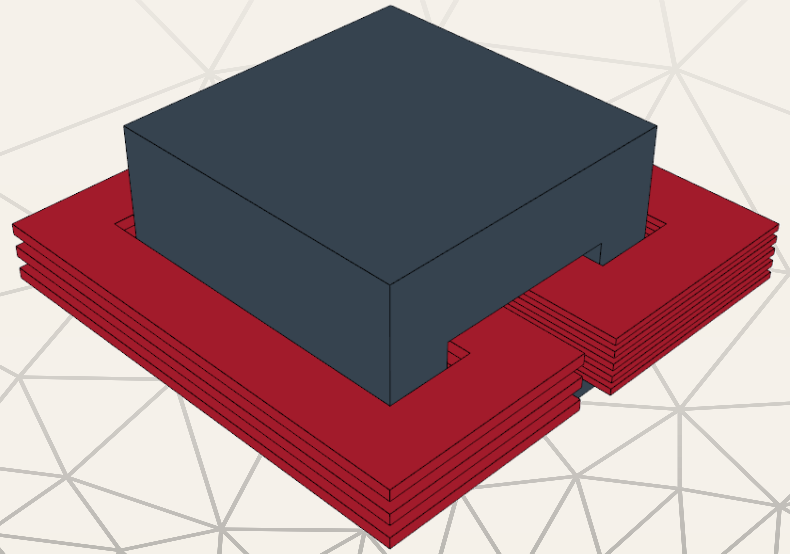
Annual Meeting 2026

www.magnetisim.com

PLANNiNG

Part 1: 45mnt + Break

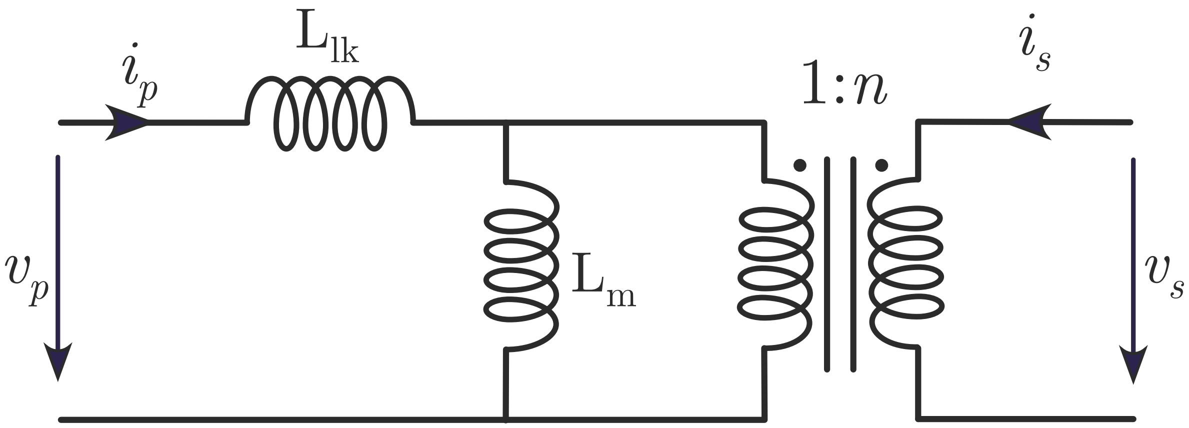
Part 2: 45mnt + 30mnt



01 MAGNETI… what?

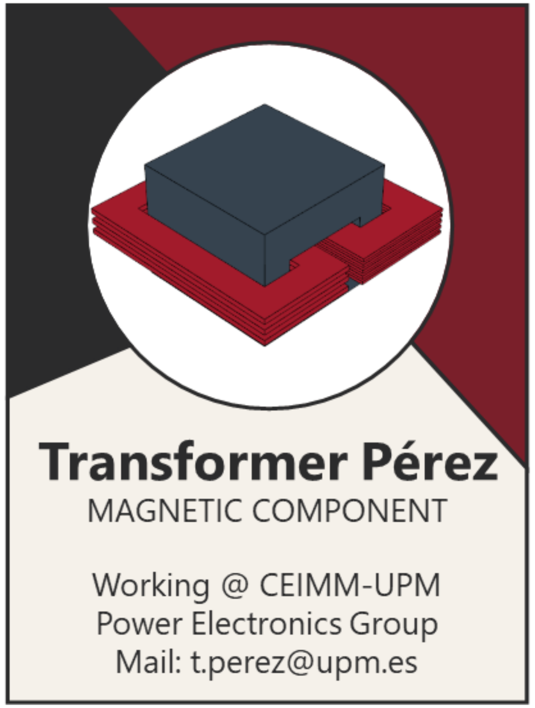
- Why MAGNETISiM?
- What’s MAGNETISiM?
- Inside MAGNETISiM

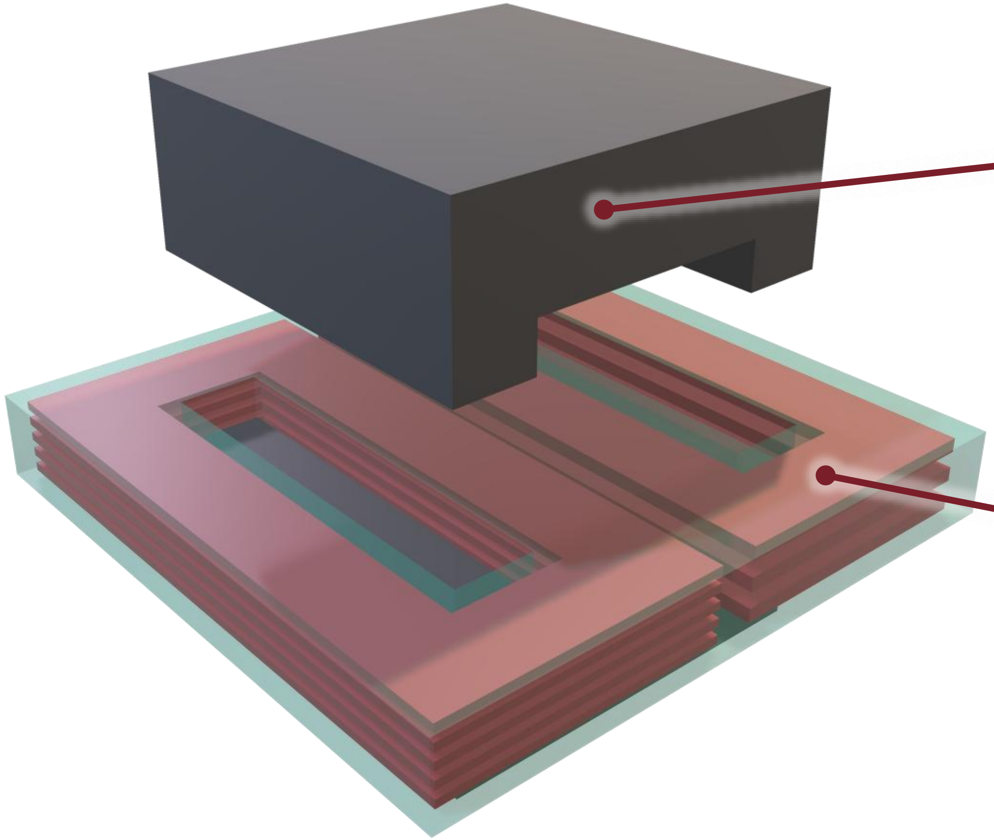
Some Context (I)



$$\begin{bmatrix} v_p \\ v_s \end{bmatrix} = \begin{bmatrix} z_{pp} & z_{sp} \\ z_{sp} & z_{ss} \end{bmatrix} \cdot \begin{bmatrix} i_p \\ i_s \end{bmatrix}$$

Component's ID





CORE

Ferromagnetic Material (Ferrite)

Drives the Magnetic Field

WINDING

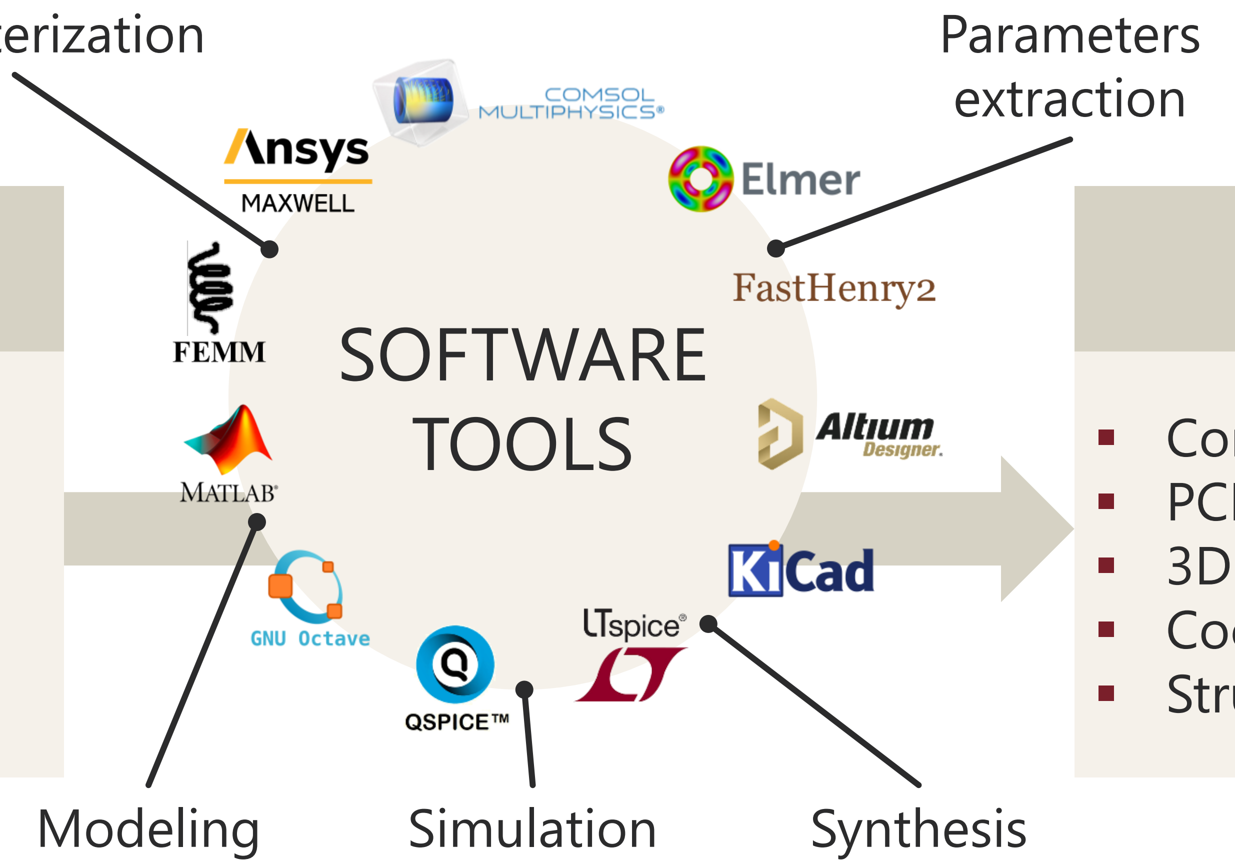
Conductive Material (Copper)

Drives the Electric Current

Magnetic Components Design Process

INPUTS

- Constraints
  - Power
  - Losses/Temperature
  - Dimensions
  - Budget
- Preliminary design



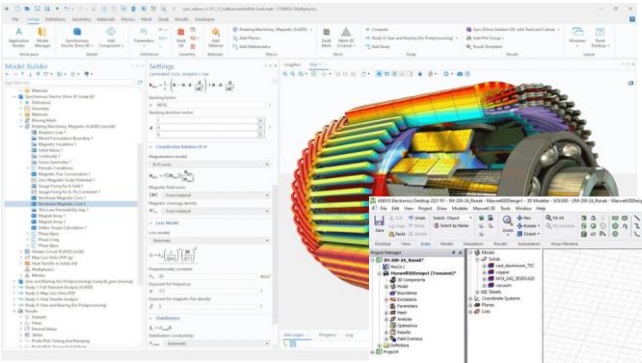
OUTPUTS

- Component analysis
- PCB winding
- 3D bobbin
- Cooling strategies
- Structure

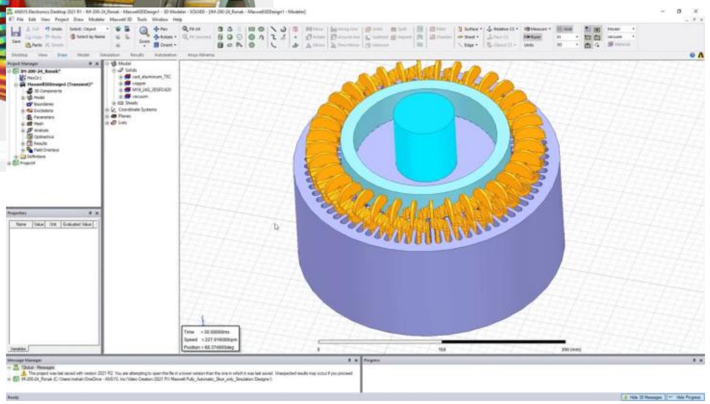
Why MAGNETISiM?

Ansys

COMSOL MULTIPHYSICS®



SOURCE: comsol.com

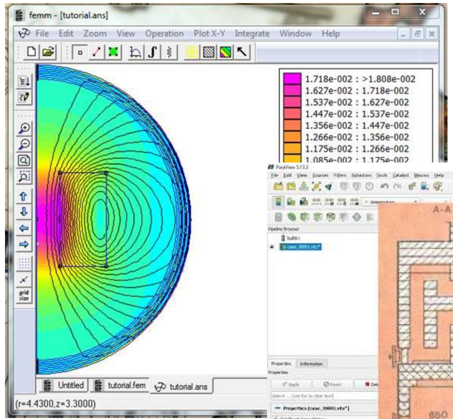


SOURCE: ansys.com

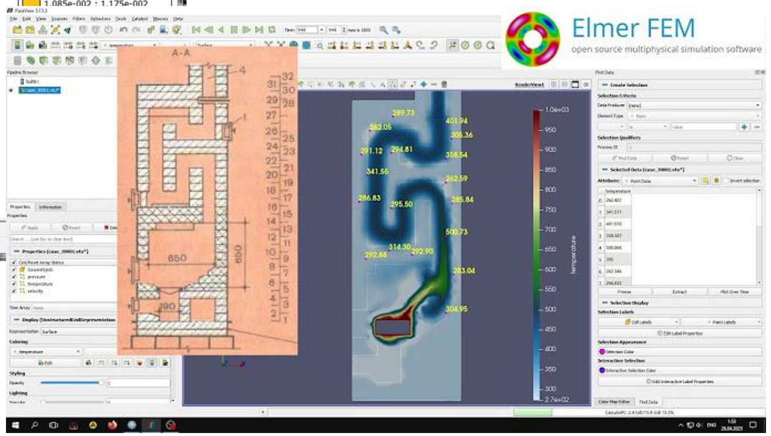
- ✘ License required
- ✓ Very powerful
- ✓ Moderate difficulty level

Elmer FEM
open source multiphysical simulation software

Finite Element Method Magnetics



SOURCE: femm.info



SOURCE: Danial Iskhakov (YouTube)

- ✓ Free
- ✓ Powerful
- ✘ Difficult to use

What’s MAGNETISiM?

DESIGN

- **Core**
  - Geometry
  - Material
- **Winding**
  - Geometry
  - Material

MAGNETISiM

OUTPUT

- **Impedance matrix**
  - Full
  - Equivalent
- **Currents/voltages per layer**
- **Losses**
- Electric (WIP)
- Thermal (WIP)

What's MAGNETISiM?

MAGNETISM

Invisible physical force produced by moving electric charges or spinning electrons within a material, resulting in the attraction or repulsion of objects.

SOURCE: National Geographic

SiMULATION

Imitative representation of a real-world system, process, or object over time, often conducted using computers or mathematical models to predict behavior, analyze performance, or train users.

SOURCE: Ansys

What's MAGNETISiM?

MAGNETISiM

SPICESiM

CAPACITISiM

EXPERTISiM

PCBSiM

What’s MAGNETISiM?

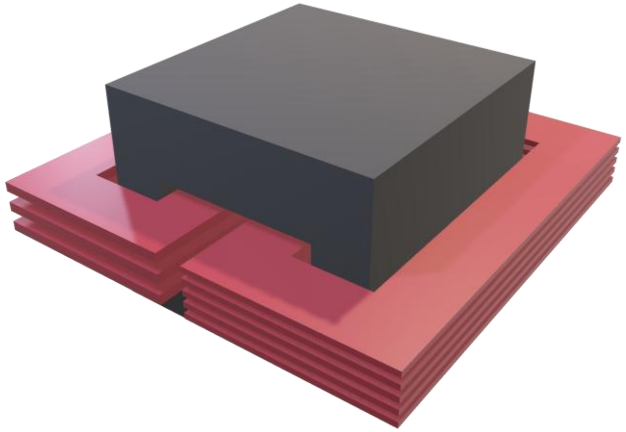
MAGNETISiM

SPICESiM

CAPACITISiM

EXPERTISiM

PCBSiM



What's MAGNETISiM?

MAGNETISiM

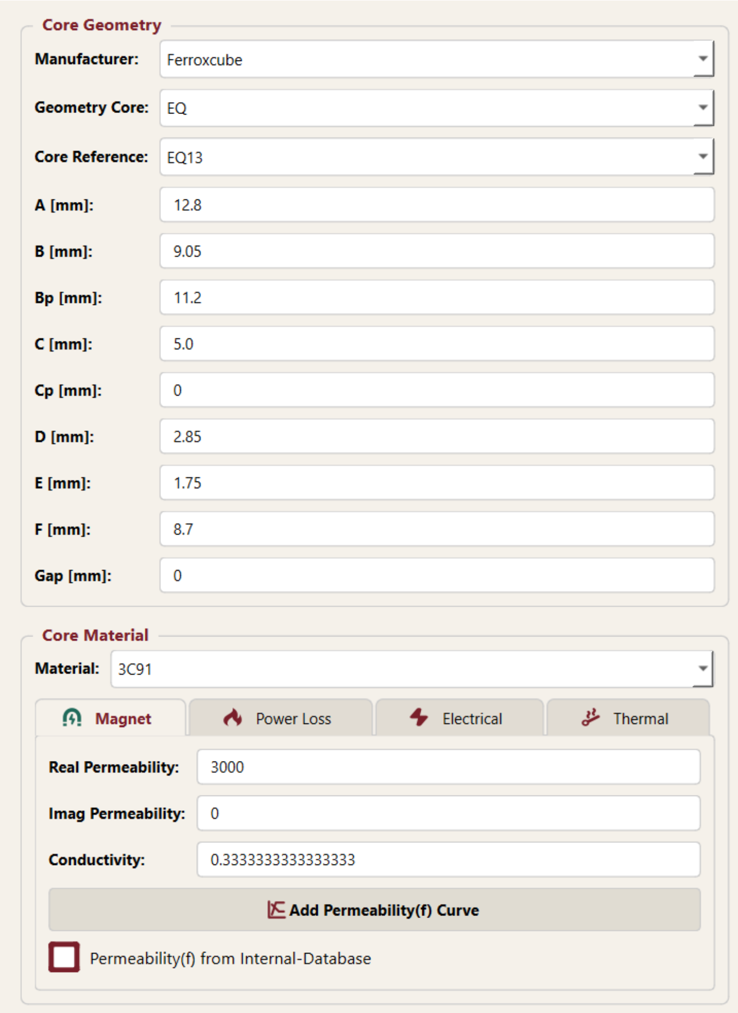
SPICESiM

CAPACITISiM

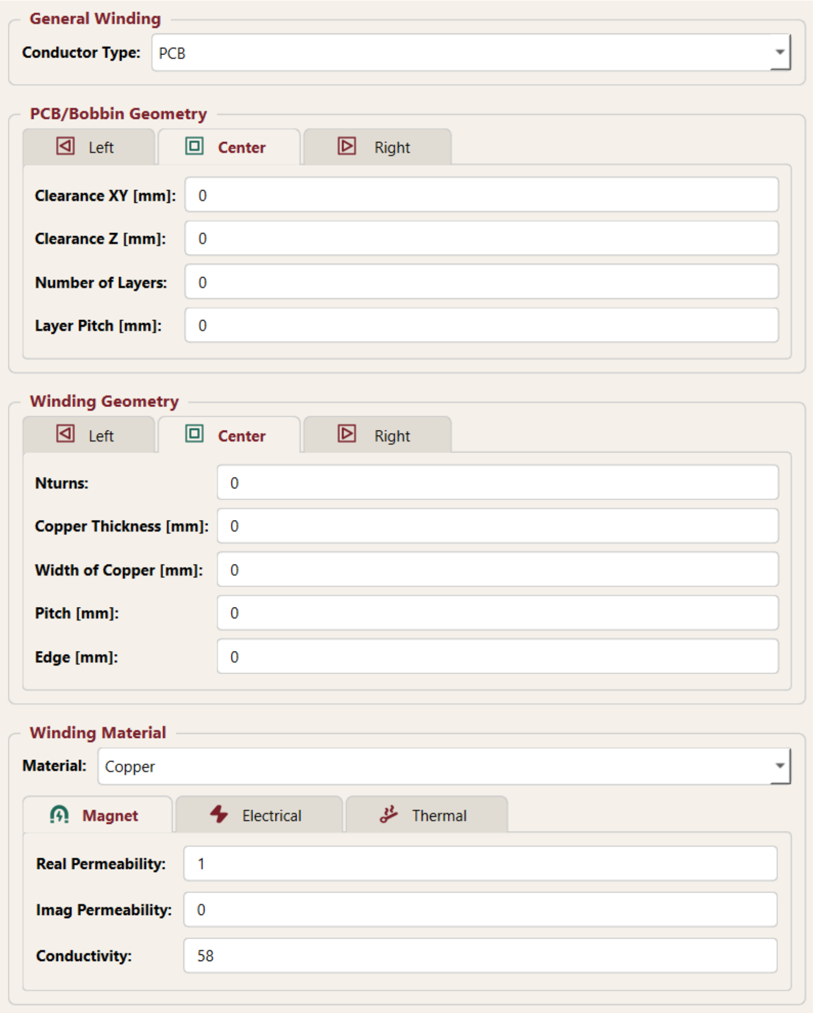
EXPERTISiM

PCBSiM

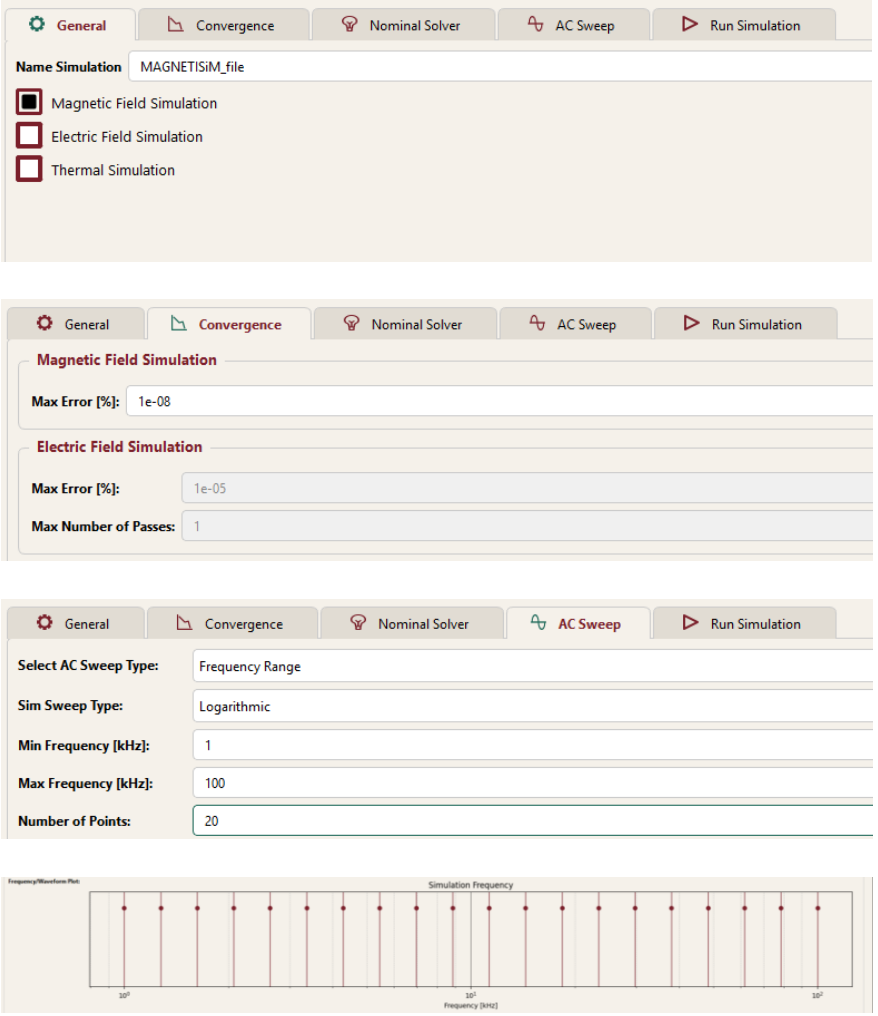
Core Configuration



Winding Configuration

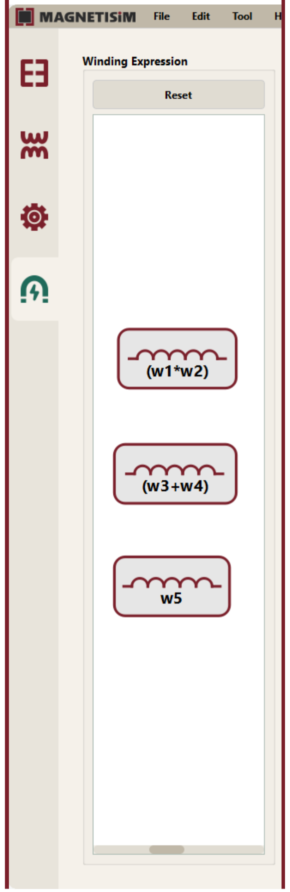


Simulation Configuration



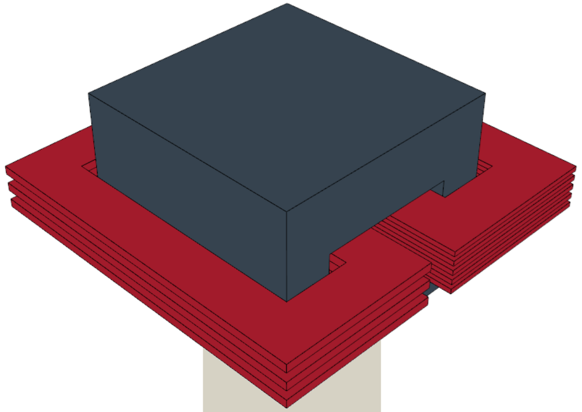
Outputs

Winding Manager

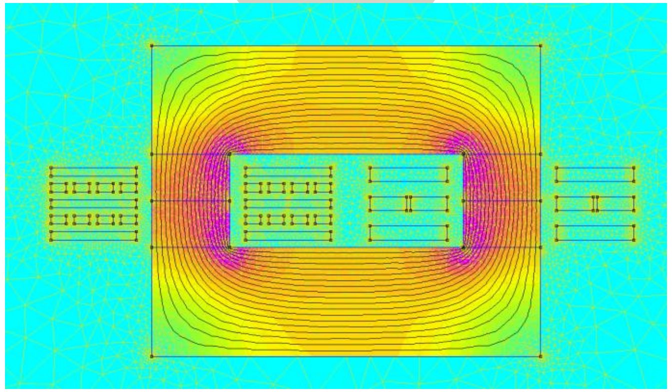


Inside MAGNETISiM

3D model



2D FEMM simulation



2D vs 3D simulations

- ✓ Faster
- ✓ Less resources
- ✗ But… not really the same model

Solution

STEP 1 – Categorize cores

STEP 2 – Include adjustments

Transparent for the user!!!

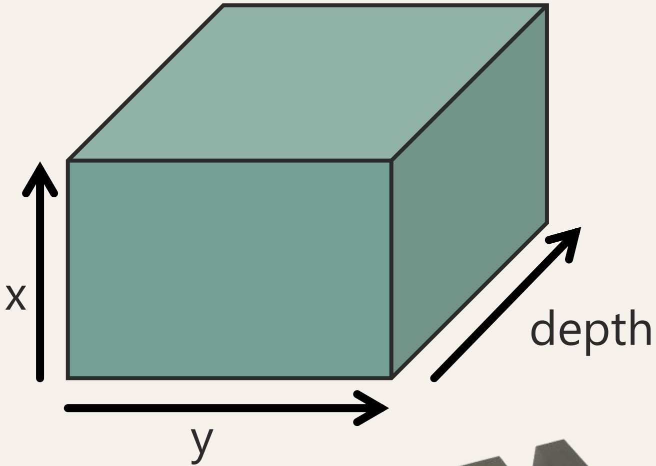
Adjusted 2D vs 3D simulations

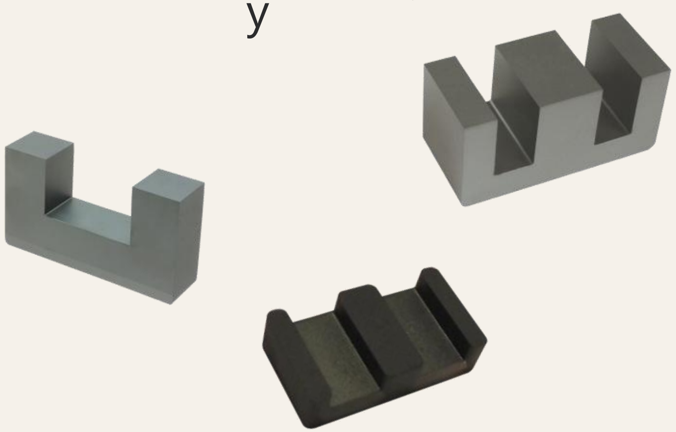
- ✓ Faster
- ✓ Less resources
- ✓ Reliable results

Inside MAGNETISiM

XY CORES

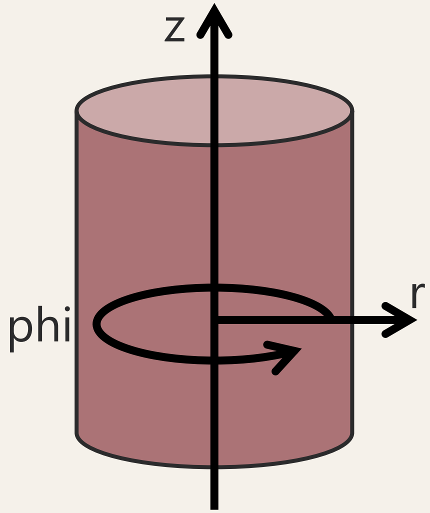
- AIRXY
- IPTXY
- E
- EI
- EPlanar
- EIPlanar
- EL
- ELT
- EC
- U
- UI

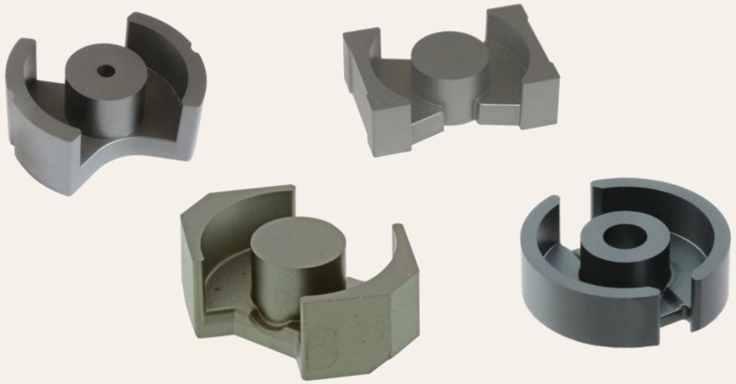




RZ CORES

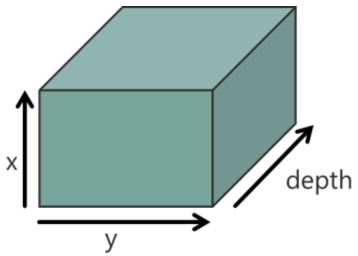
- AIRRZ
- IPTRZ
- EQ
- EQPLT
- PQ
- PQI
- P
- PT
- PH
- PM
- RM
- ER
- ERPlanar
- EIRPlanar
- ETD

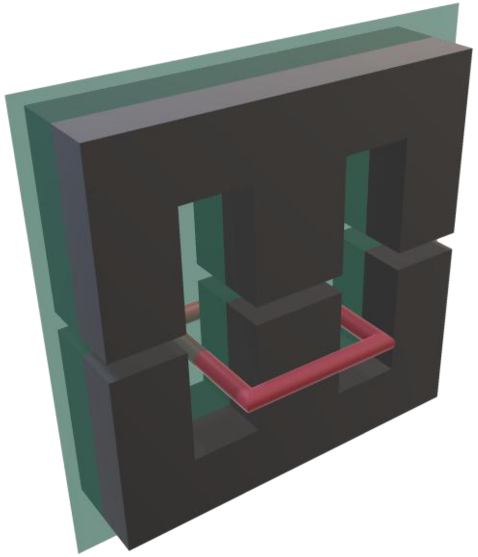




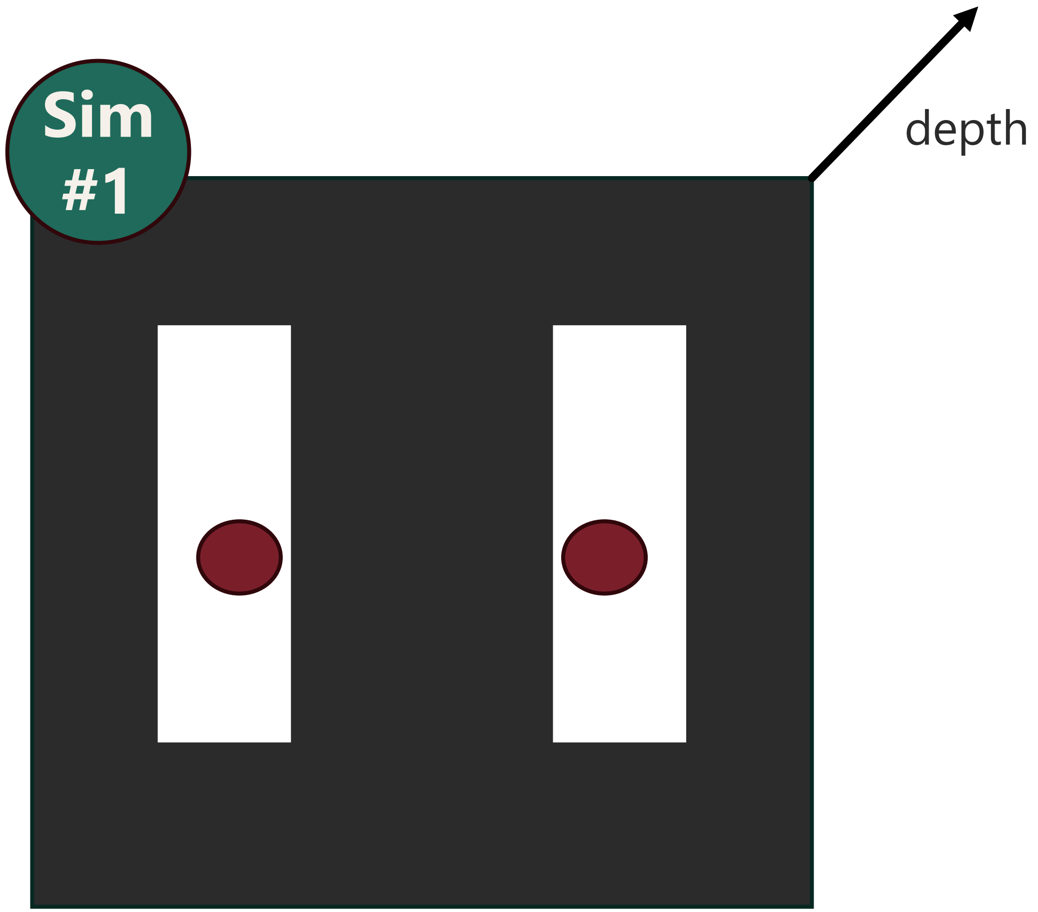
SOURCES: Ferroxcube Catalog

XY CORES

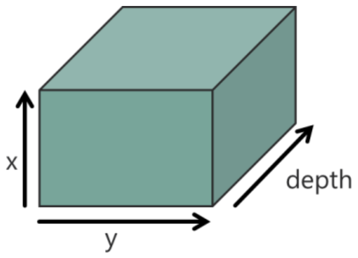


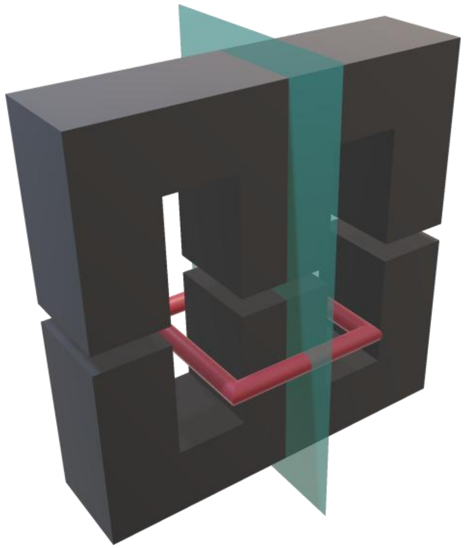


- AIRXY
- IPTXY
- E
- EI
- EPlanar
- EIPlanar
- EL
- ELT
- EC
- U
- UI



XY CORES





- AIRXY
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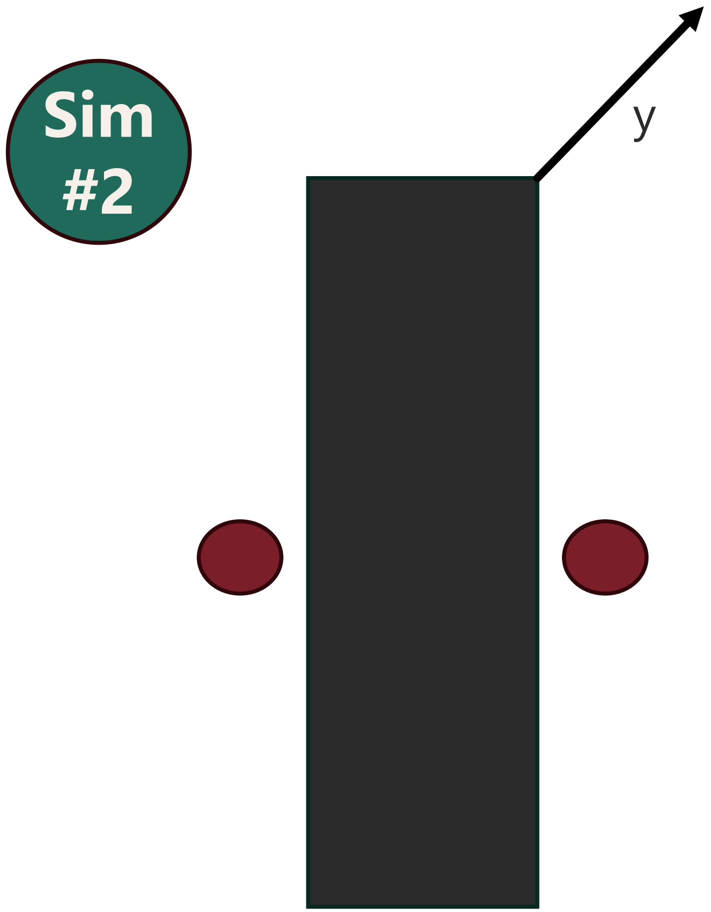
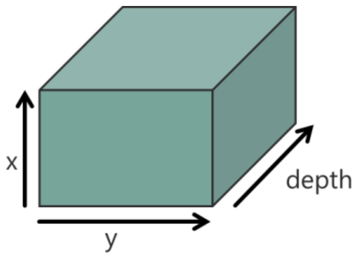


Inside MAGNETISiM

XY Core Modeling

XY CORES



- AIRXY
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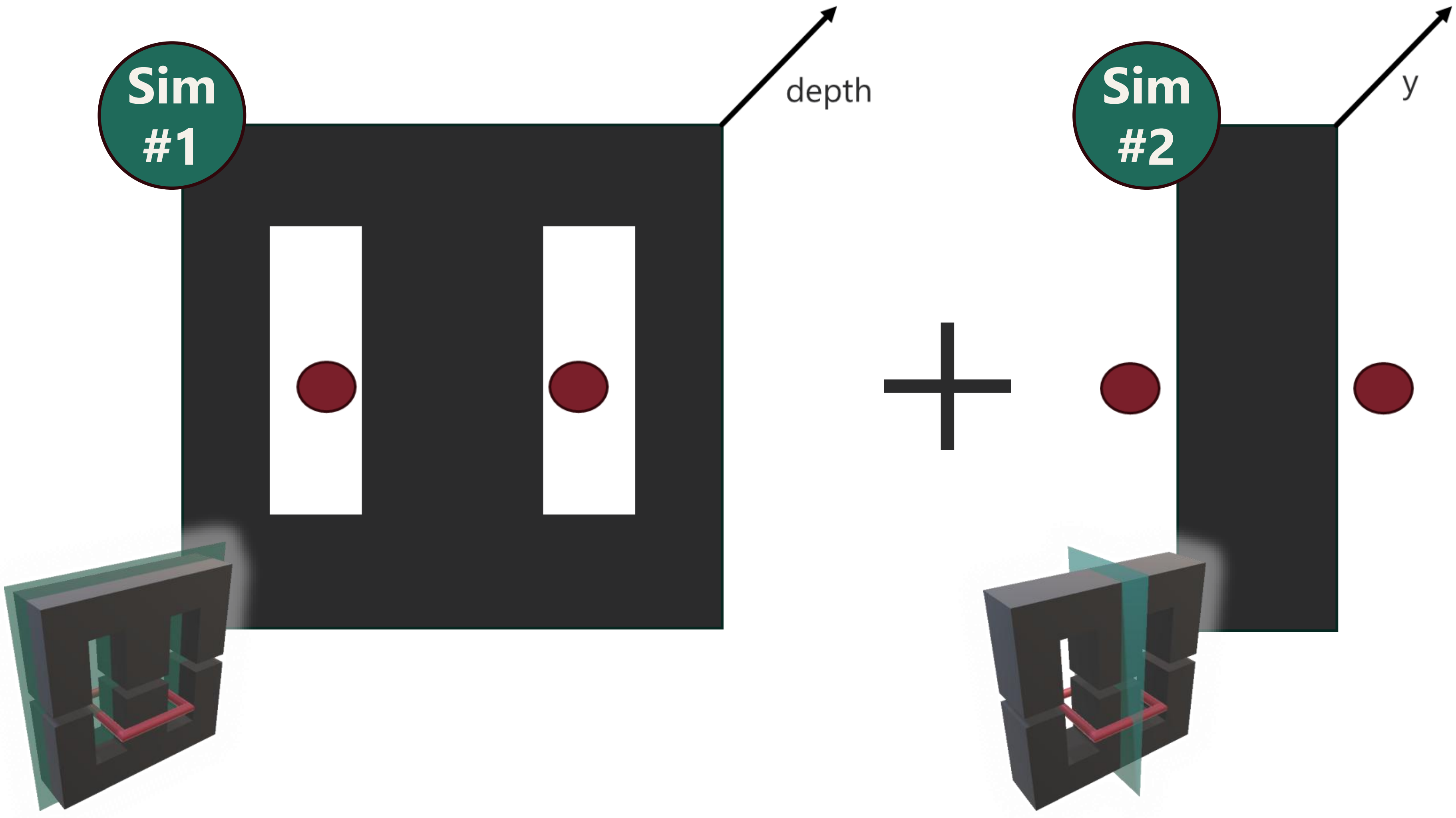


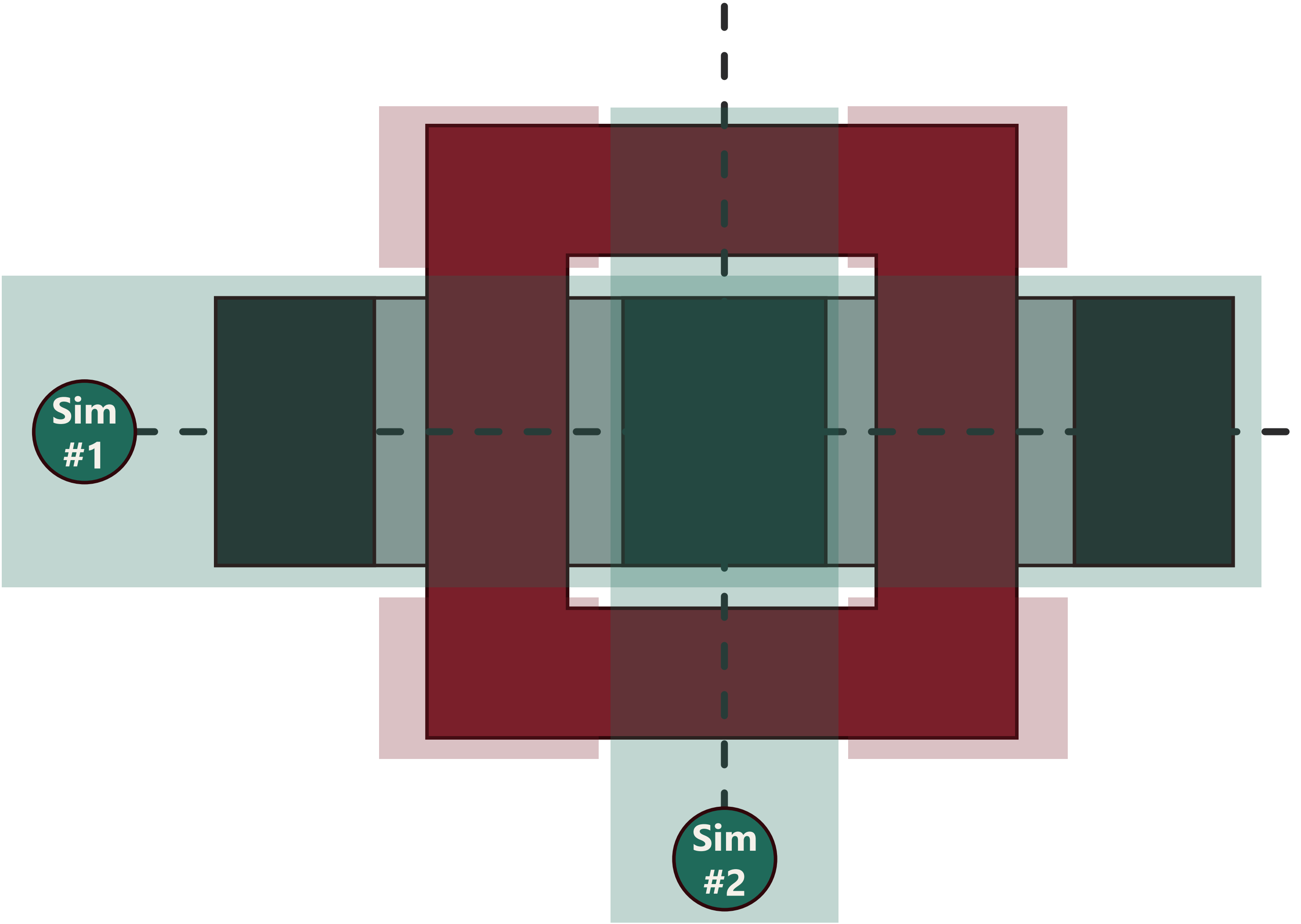
XY Core Modeling

Simulated regions

Not-simulated regions

- Small errors in resistance
- Negligible errors in energy

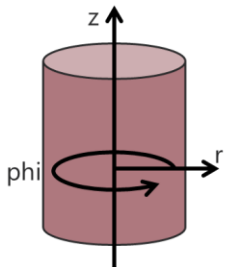
Good general results
(as we will see later on)

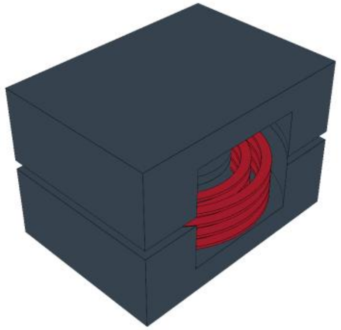


Inside MAGNETISiM

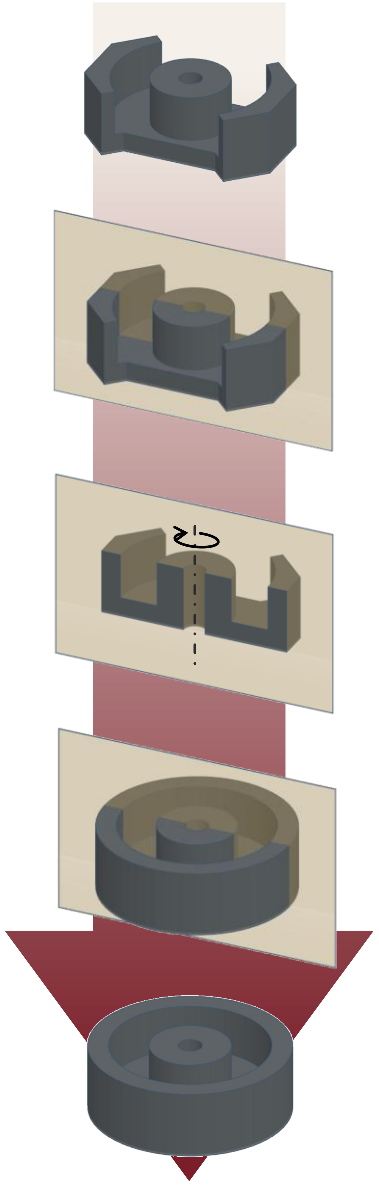
RZ Core Modeling

RZ CORES

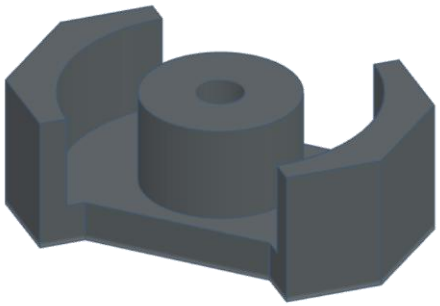




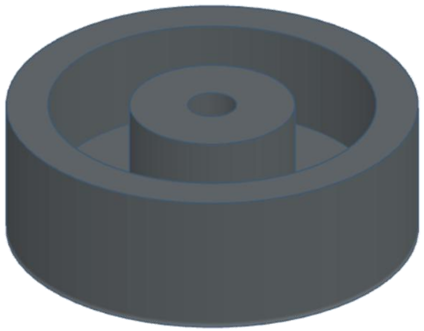
- AIRRZ
- IPTRZ
- EQ + EQPLT
- PQ + PQI
- P
- PT
- PH
- PM
- RM
- ER
- ERPlanar
- EIRPlanar
- ETD

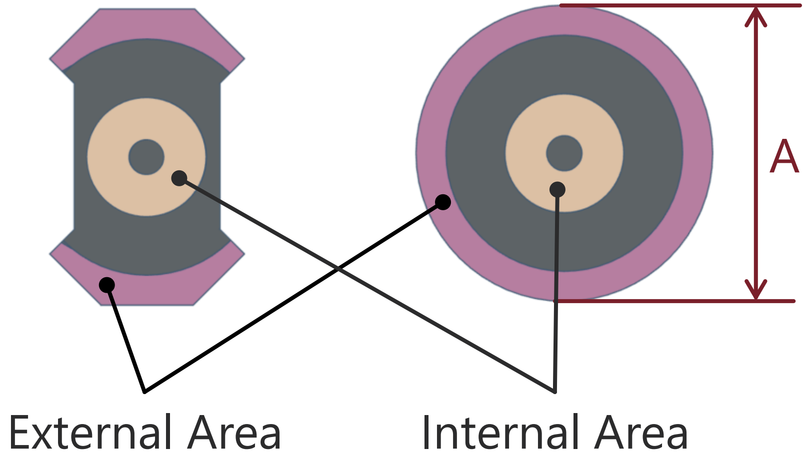


Real Geometry

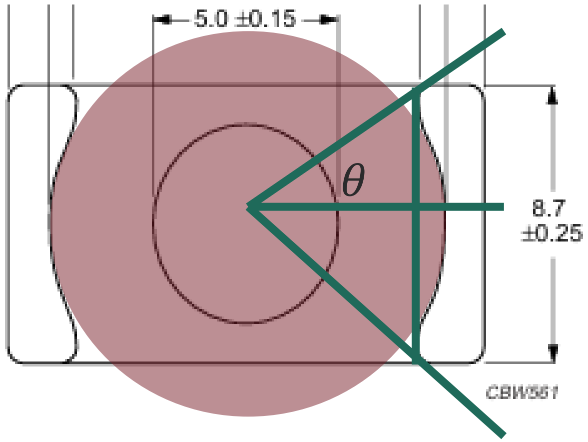


Simulated geometry





RZ Core Modeling

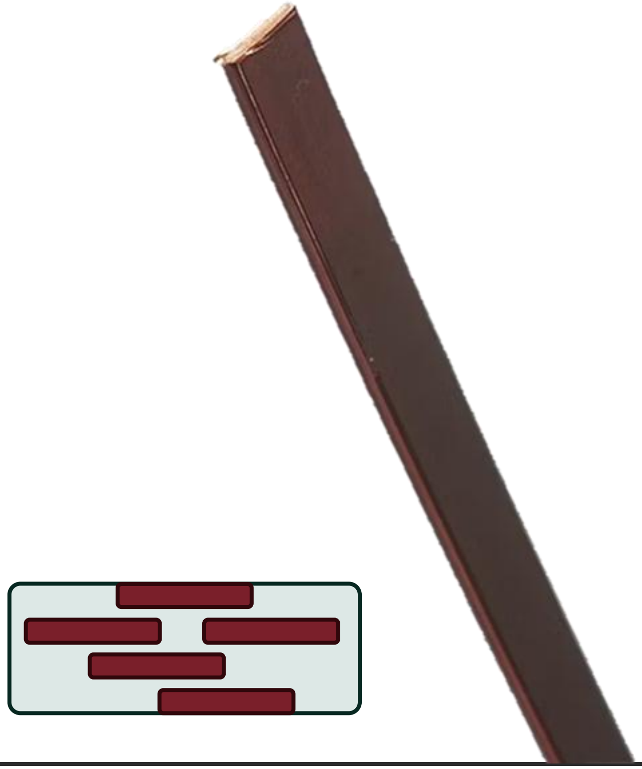


$$\left(A^2 - B_p^2\right)\frac{\pi}{4} = 2\left(A_{\text{square}} - \left(A_{\text{cheese}} - 2A_{triangle}\right)\right)$$

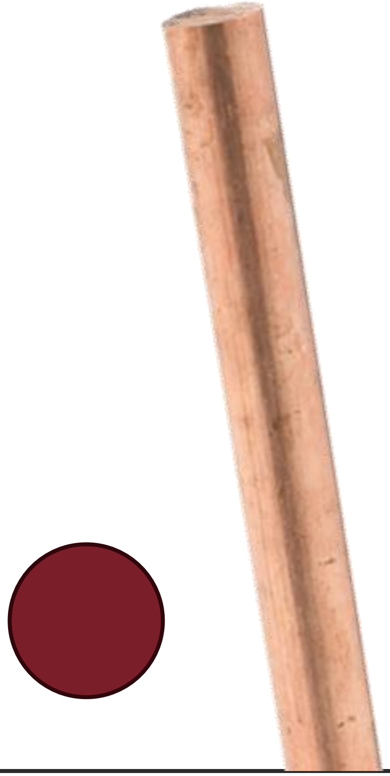
$$cos\theta = \frac{B}{B_p} \rightarrow A_{\text{cheese}} = \frac{B_p^2}{4}\pi \cdot \frac{arcos\left(\frac{B}{B_p}\right)}{2\pi} * 2 = \frac{B_p^2}{4} arcos\left(\frac{B}{B_p}\right)$$

$$A_{triangle} = \frac{B}{2} \cdot \frac{F}{2} \qquad A_{square} = F \cdot \frac{B - A}{2}$$

Planar and PCB

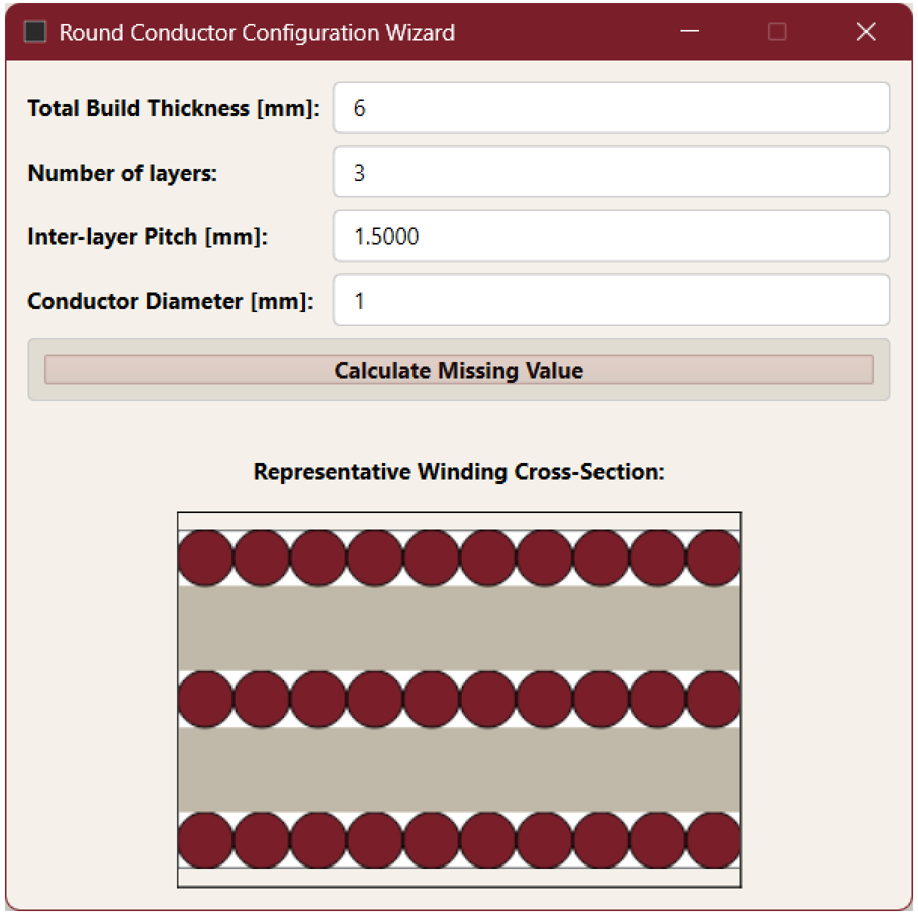


Round

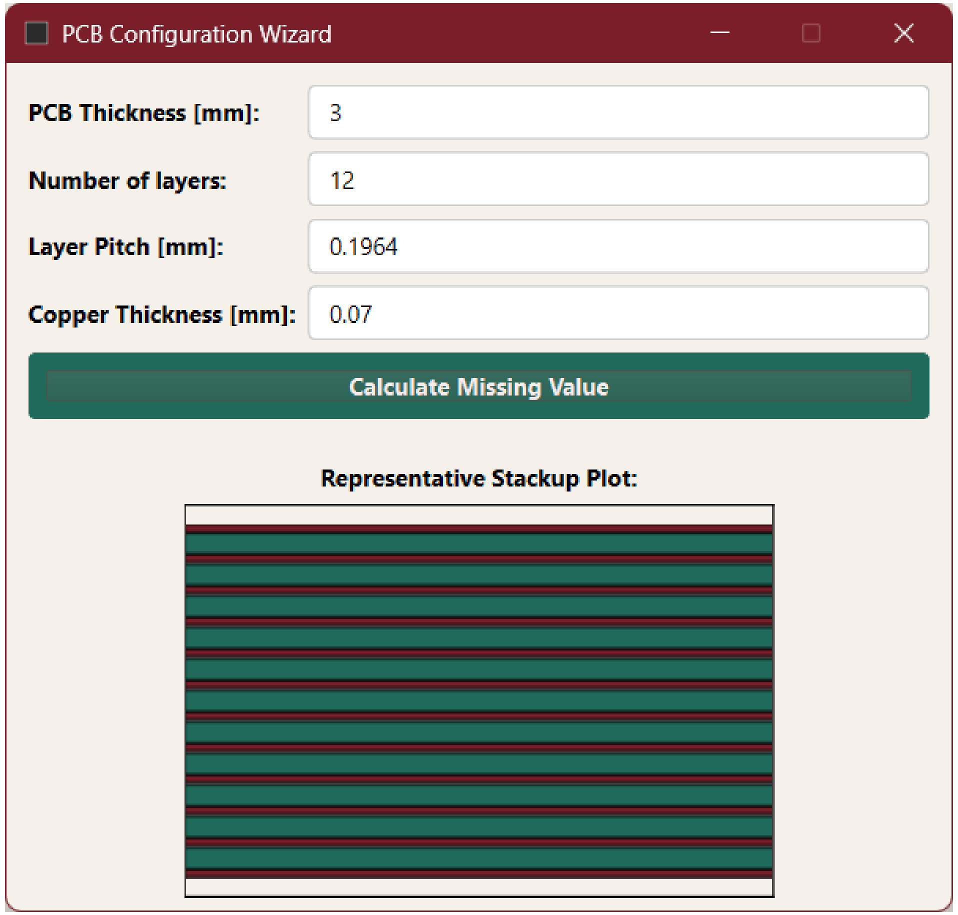


Litz

Round Wizard

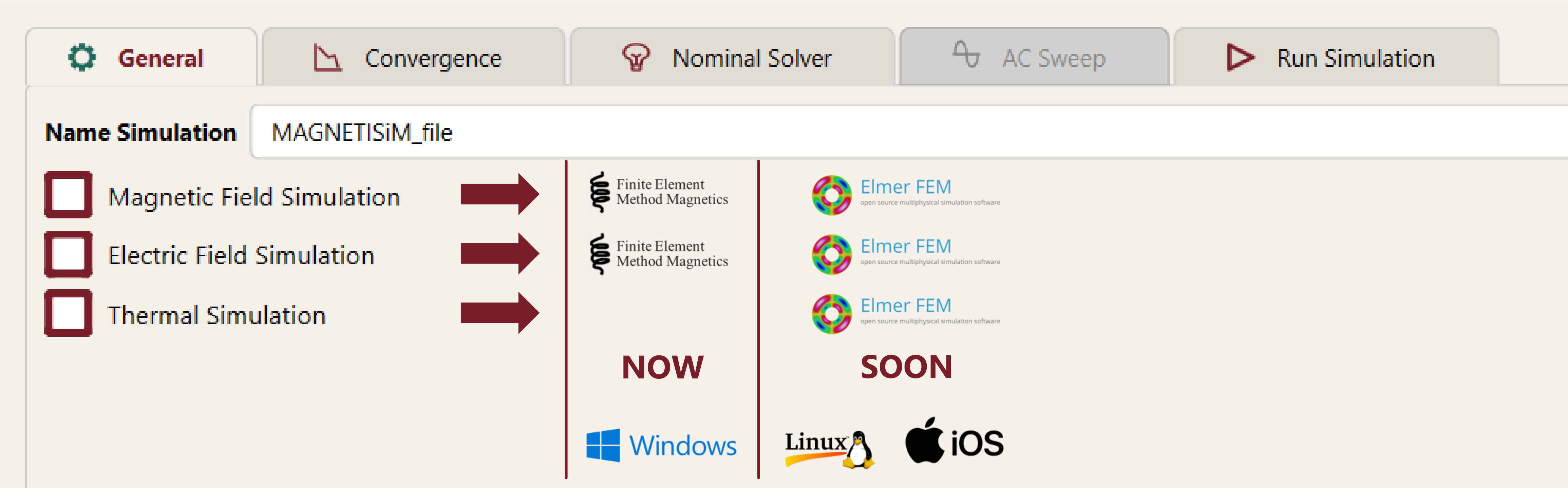


PCB Wizard

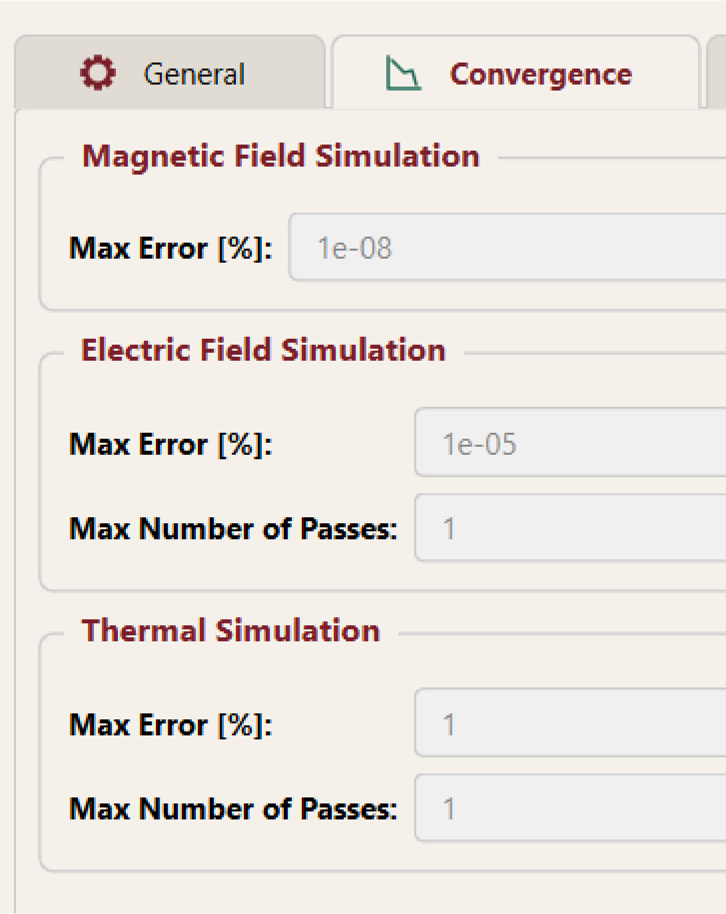


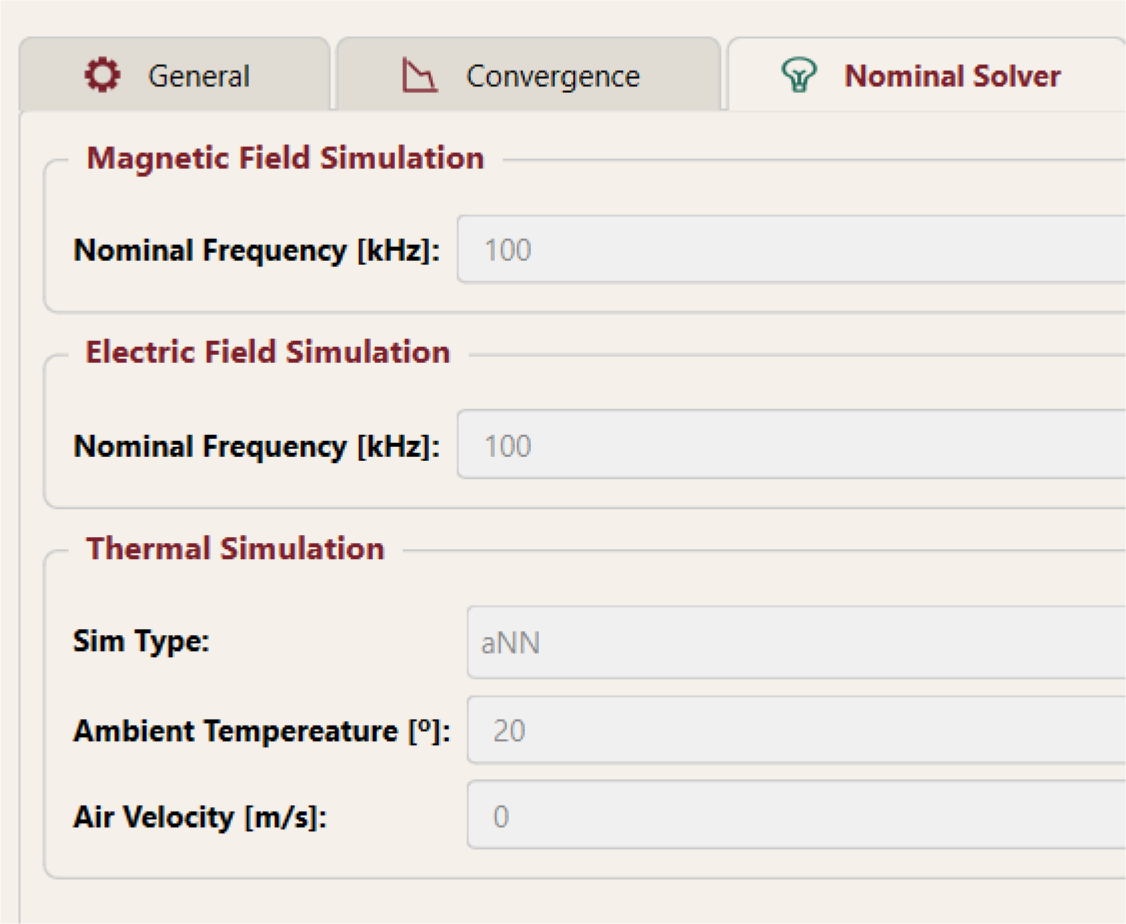
Inside MAGNETISiM

Simulation Configuration



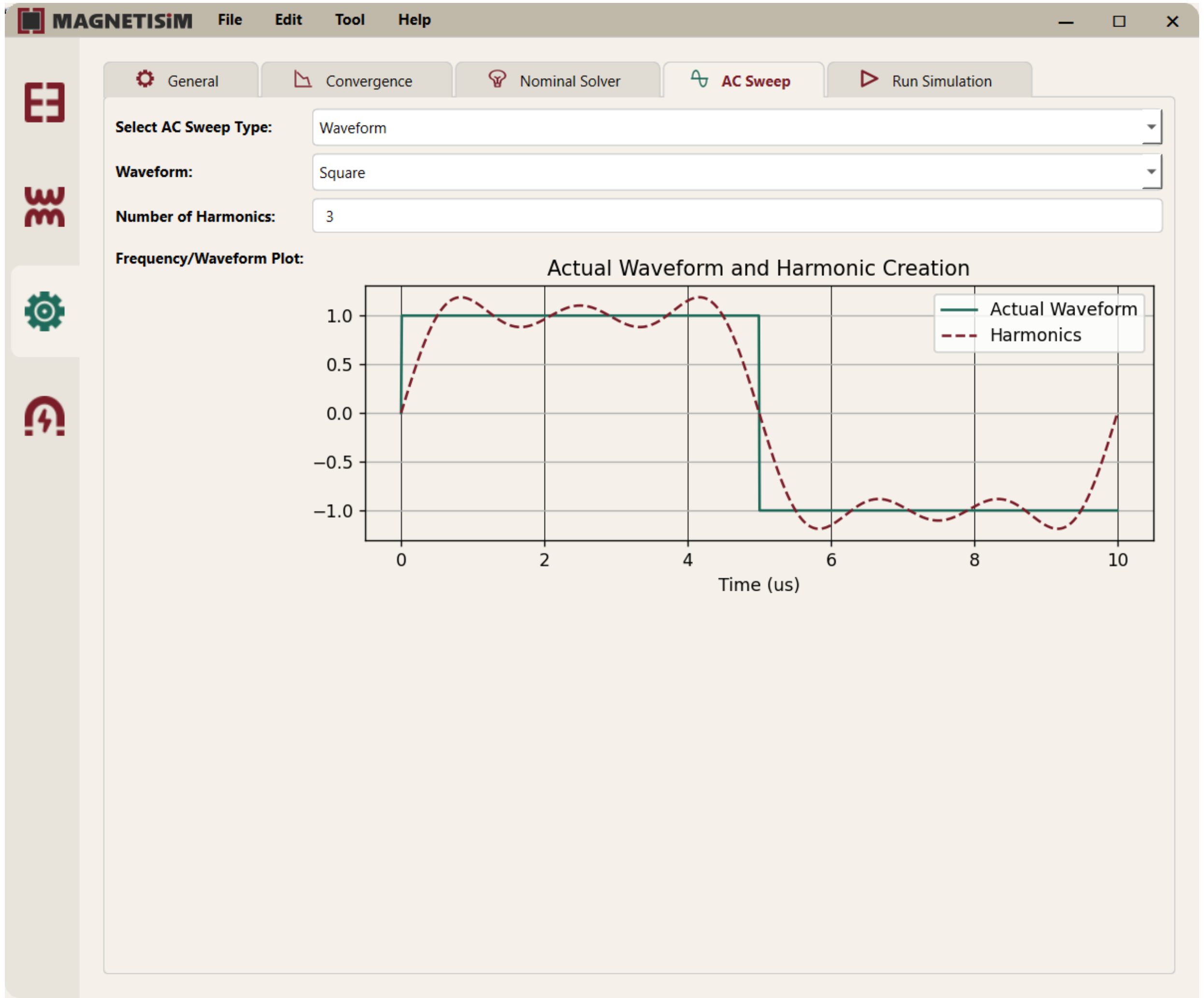
Simulation Configuration

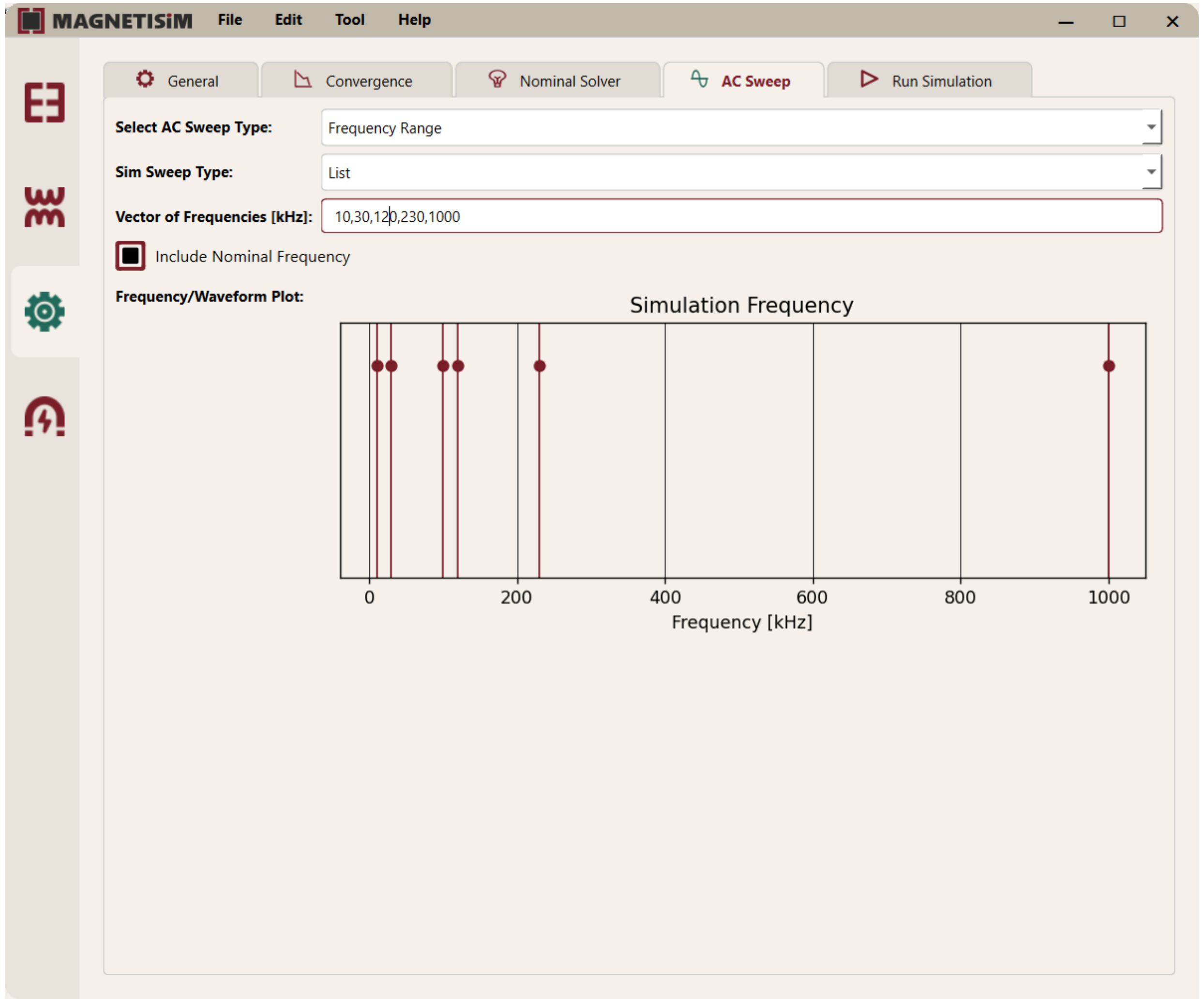




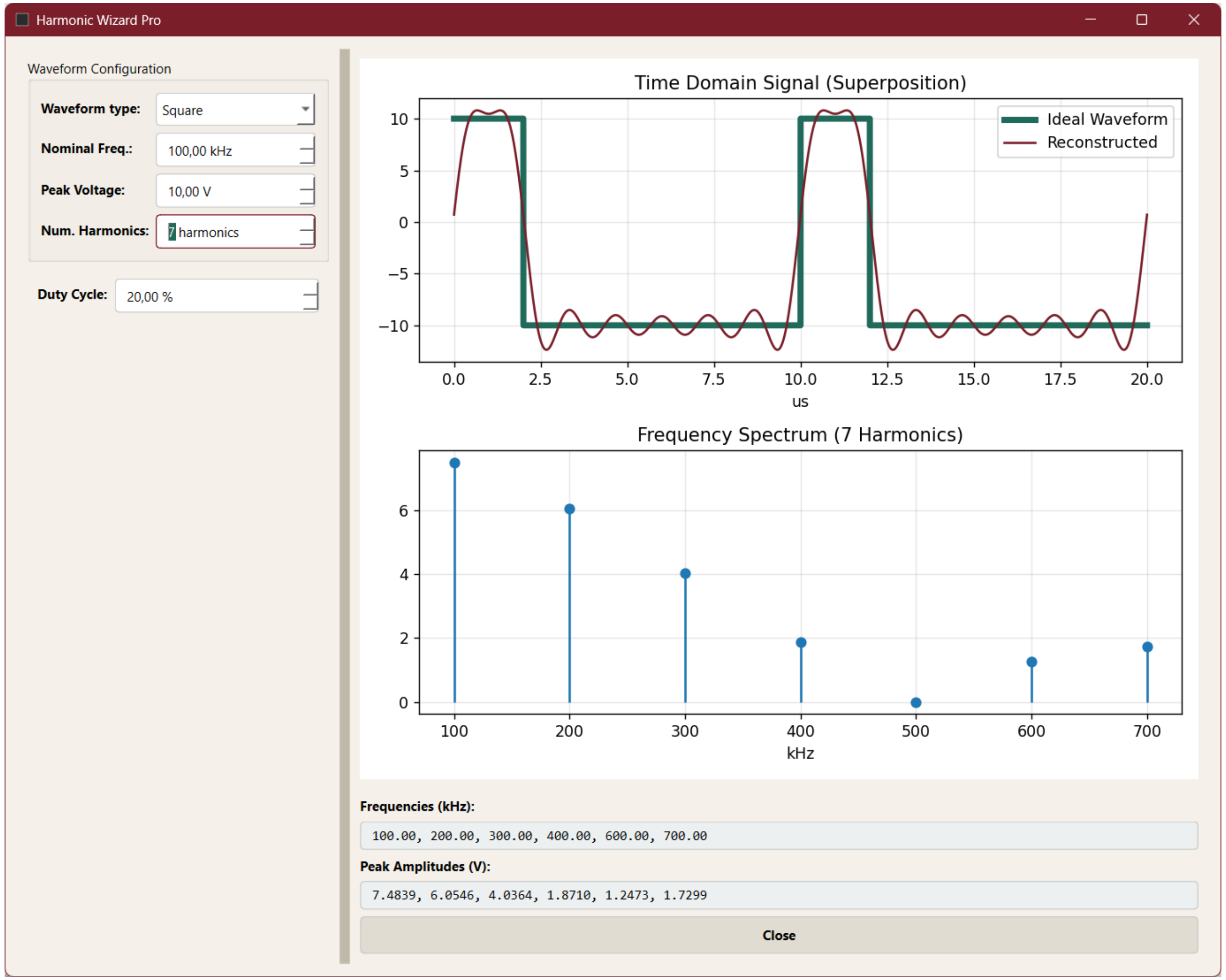
Inside MAGNETISiM

Simulation Configuration



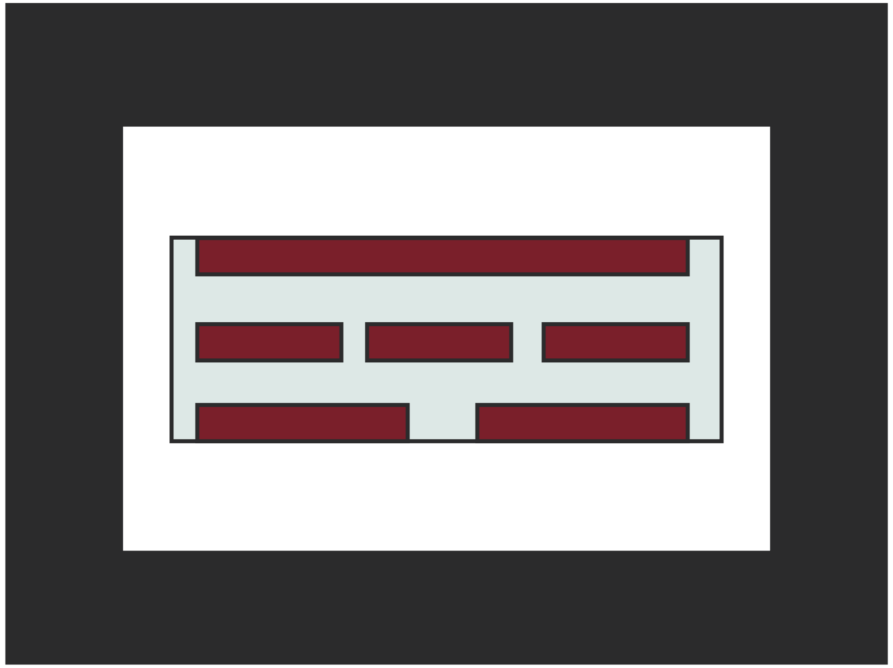


Harmonic Wizard (Pro)

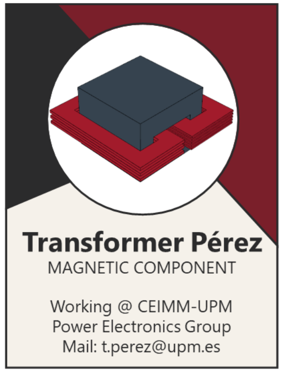


Inside MAGNETISiM

The ✨ Impedance Matrix ✨



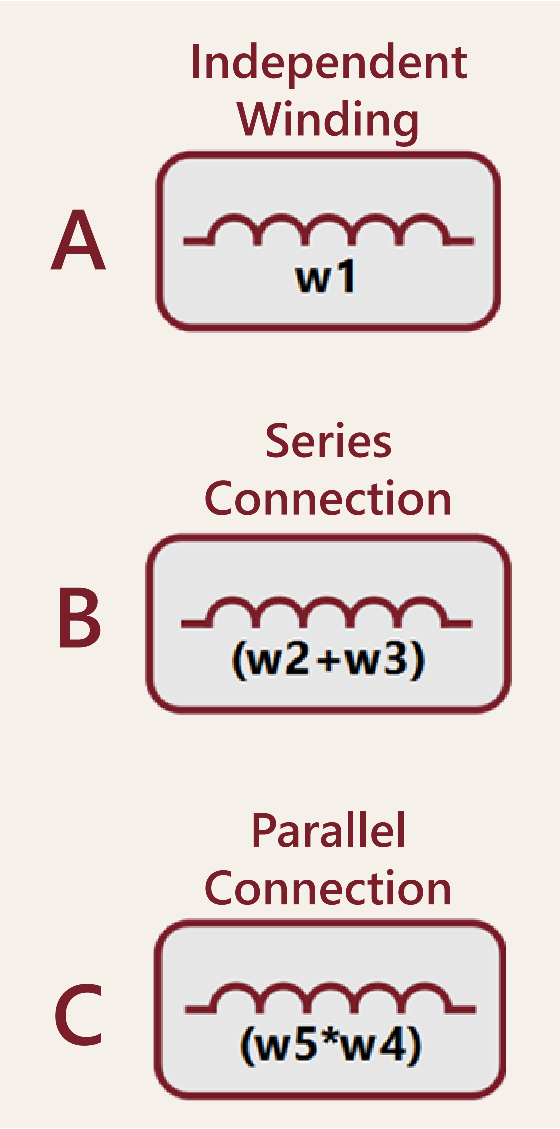
$$\begin{bmatrix} Z_{AA} & Z_{AB} & Z_{AC} \\ Z_{BA} & Z_{BB} & Z_{BC} \\ Z_{CA} & Z_{CB} & Z_{CC} \end{bmatrix}$$



Now, we can do whatever* we want

*almost whatever we want

Winding Manager



ORIGINAL MATRIX

$$\begin{bmatrix} Z_{11} & Z_{12} & Z_{13} & Z_{14} & Z_{15} \\ Z_{21} & Z_{22} & Z_{23} & Z_{24} & Z_{25} \\ Z_{31} & Z_{32} & Z_{33} & Z_{34} & Z_{35} \\ Z_{41} & Z_{42} & Z_{43} & Z_{44} & Z_{45} \\ Z_{51} & Z_{52} & Z_{53} & Z_{54} & Z_{55} \end{bmatrix}$$

REDUCED MATRIX

$$\begin{bmatrix} Z_{AA} & Z_{AB} & Z_{AC} \\ Z_{BA} & Z_{BB} & Z_{BC} \\ Z_{CA} & Z_{CB} & Z_{CC} \end{bmatrix}$$

- Our contribution to the research community
- Not open, but always free
- You can help us!

Be Part of MAGNETISiM!

Join us!

- **Bachelor's / Master's Thesis** (TFG / TFM)
- **PhD Research**
- **Freelance Collaboration**

Sponsor us!

- Sponsor a **Student Thesis** (Industrial Council)
- Support the **Project**
- Sponsor a **Custom Feature**

Report bugs!

- **Bugs Report** – Public, not Available yet
- **Pull request** – Fix Bugs and Send Suggestions

02 First Steps

- Design Configuration
- Simulation Possibilities
- Postprocessing the Results

GUI Overview

TAB MENU

Core Geometry Tab (Ctrl+1)

Winding Geometry Tab (Ctrl+2)

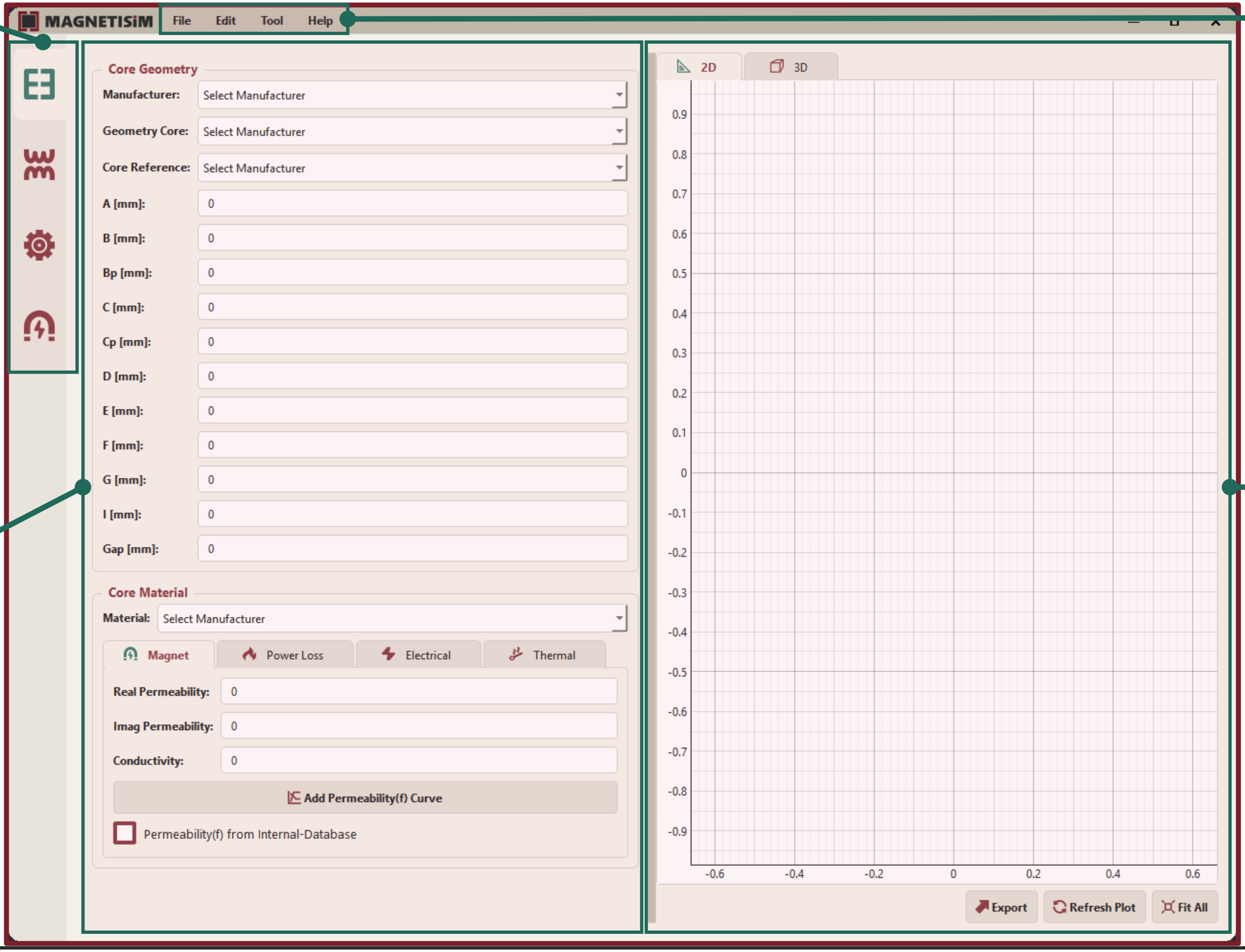
Sim Config Tab (Ctrl+3)

Magnet Tab (Ctrl+4)

INPUT FRAME

BAR TOOL

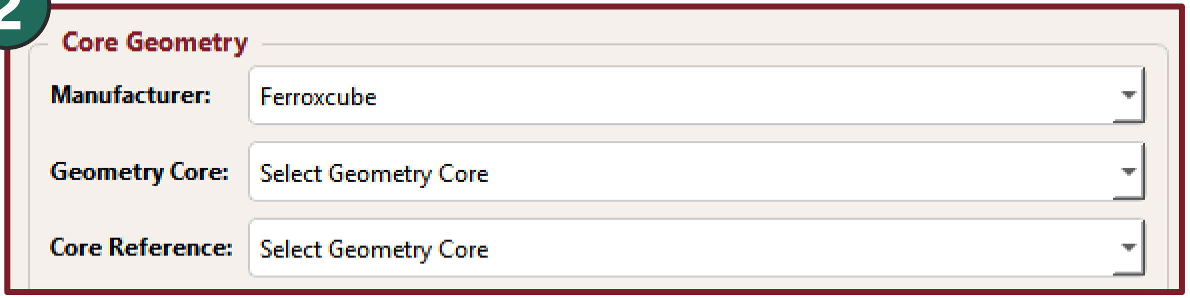
MODELER WINDOW



Core Geometry Selection

1

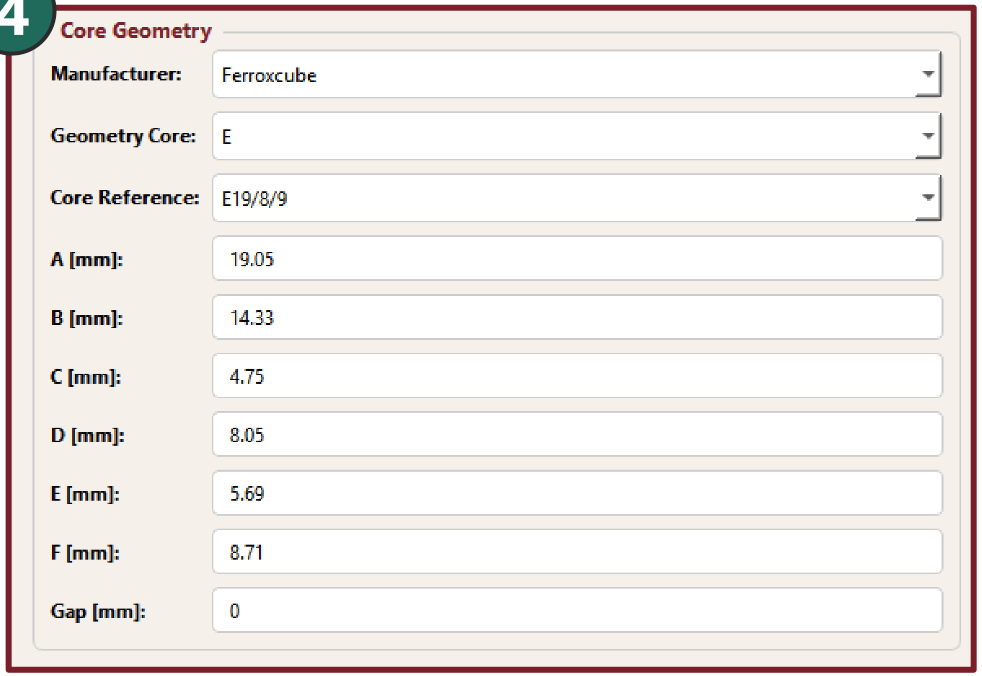
2



3

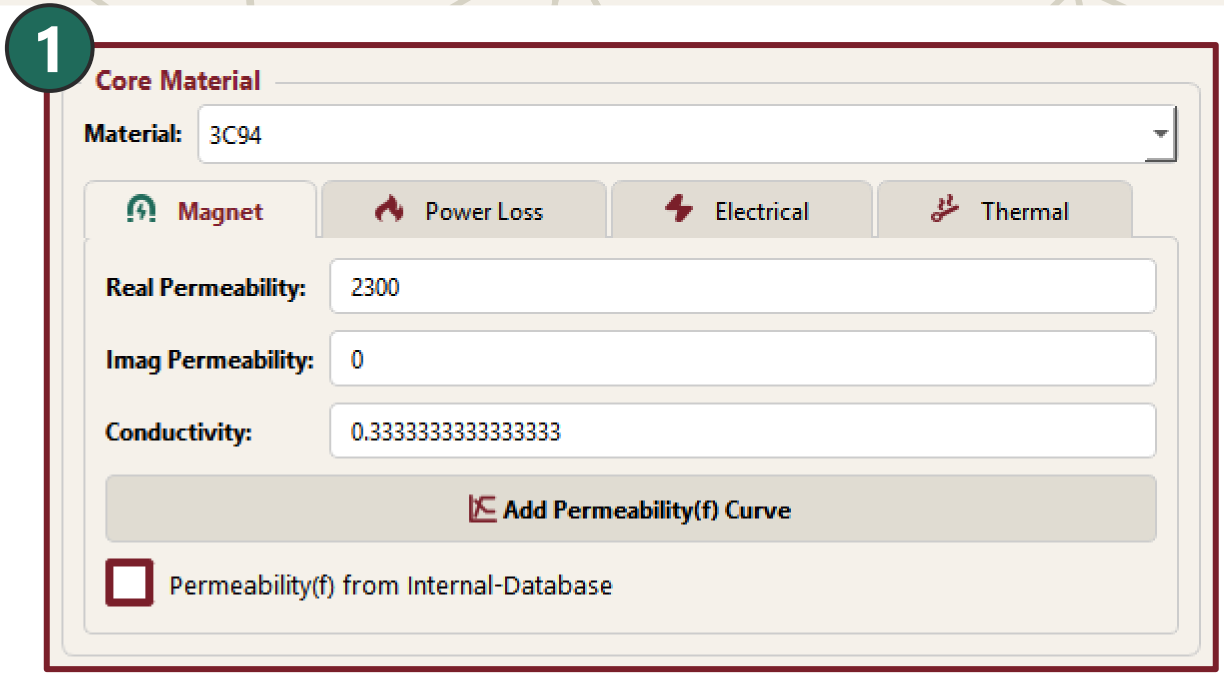
❶ Select the **manufacturer** from the menu (e.g., Ferroxcube).
❷ Select the core **geometry** (e.g., the "E" model).
❸ Select the core **reference** (e.g., E19/8/9).
❹ The system **automatically** loads the core parameters from the built-in database.

4



Legends in ***Create Magnetic Core***

Core Material Selection

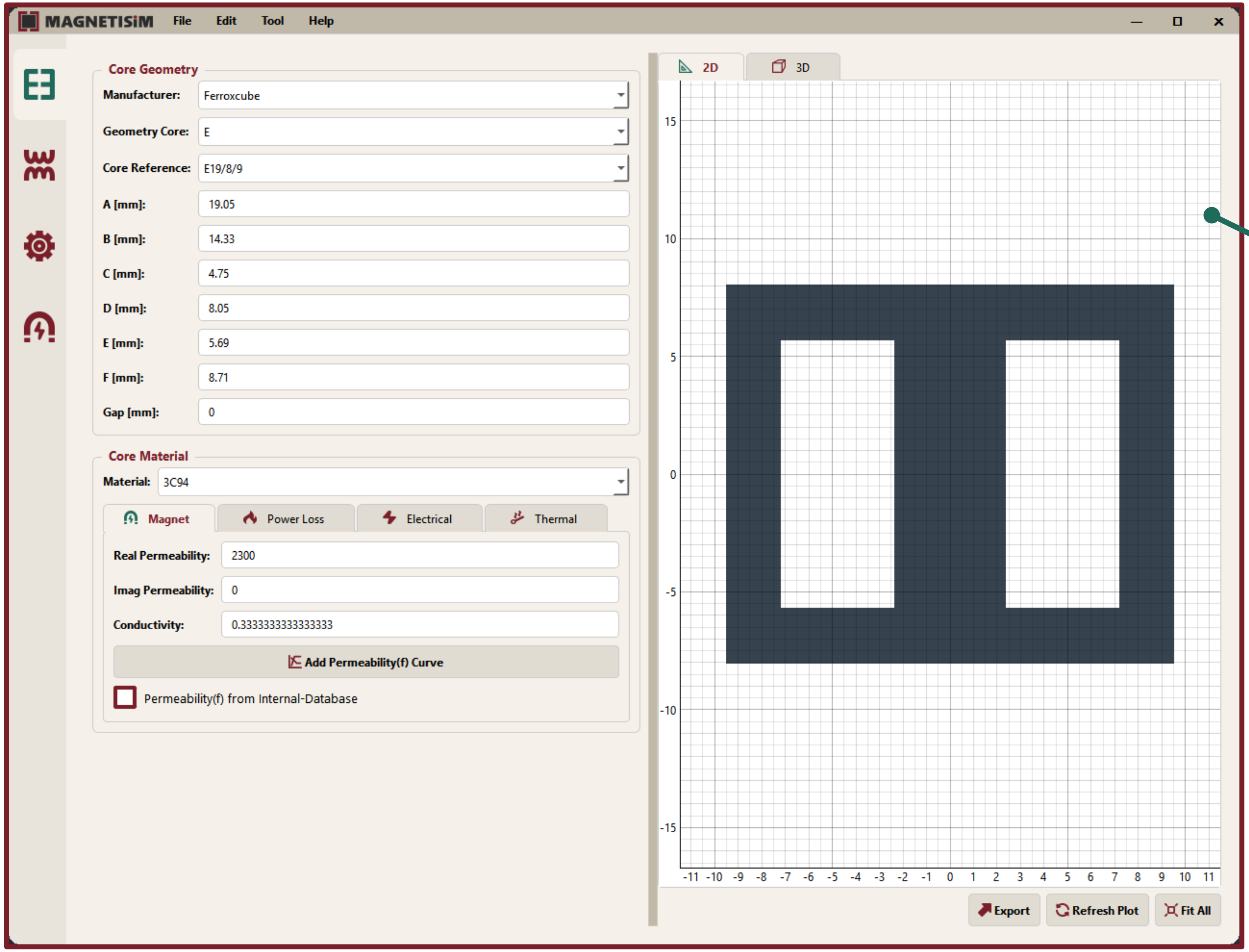


❶ Select the **material** from the menu (e.g., 3C94). The system **automatically** loads the material parameters from the built-in database.

CORE MATERIAL CHARACTERIZATION

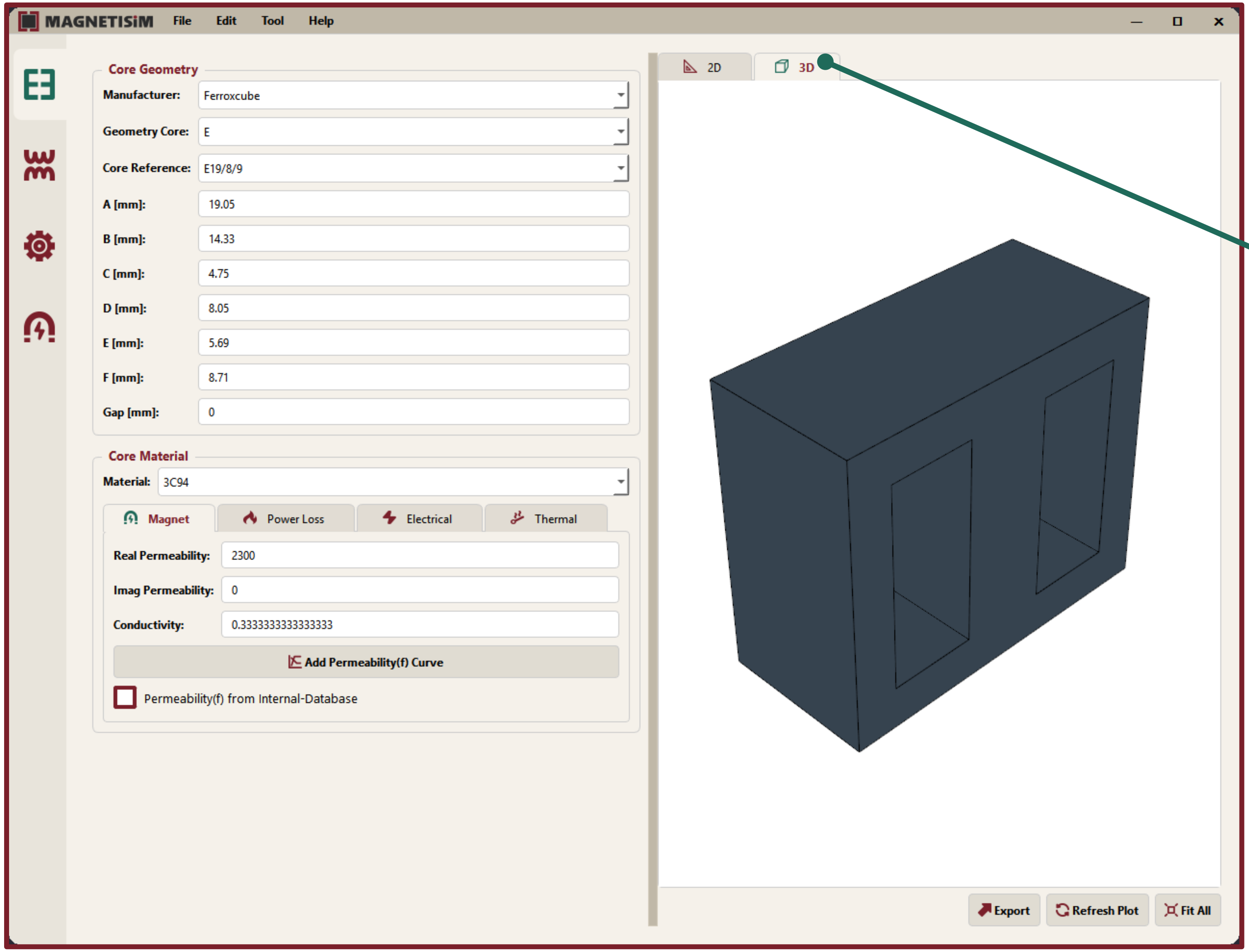
- **Magnet**
  $\mu_r' - j\mu_r''$ – Complex permeability
  Conductivity – Electrical Conductivity
- **Power Loss**
  k, α, β – Steinmetz loss model coefficients
- **Electrical**
  Pending electrical data spec
- **Thermal**
  The thermal model release is planned to take place in September 2026.

More information in ***Create Material***



Once the core and its material are configured, the **Modeler Window** allows us to confirm that everything is correctly set up.

Modeler Window

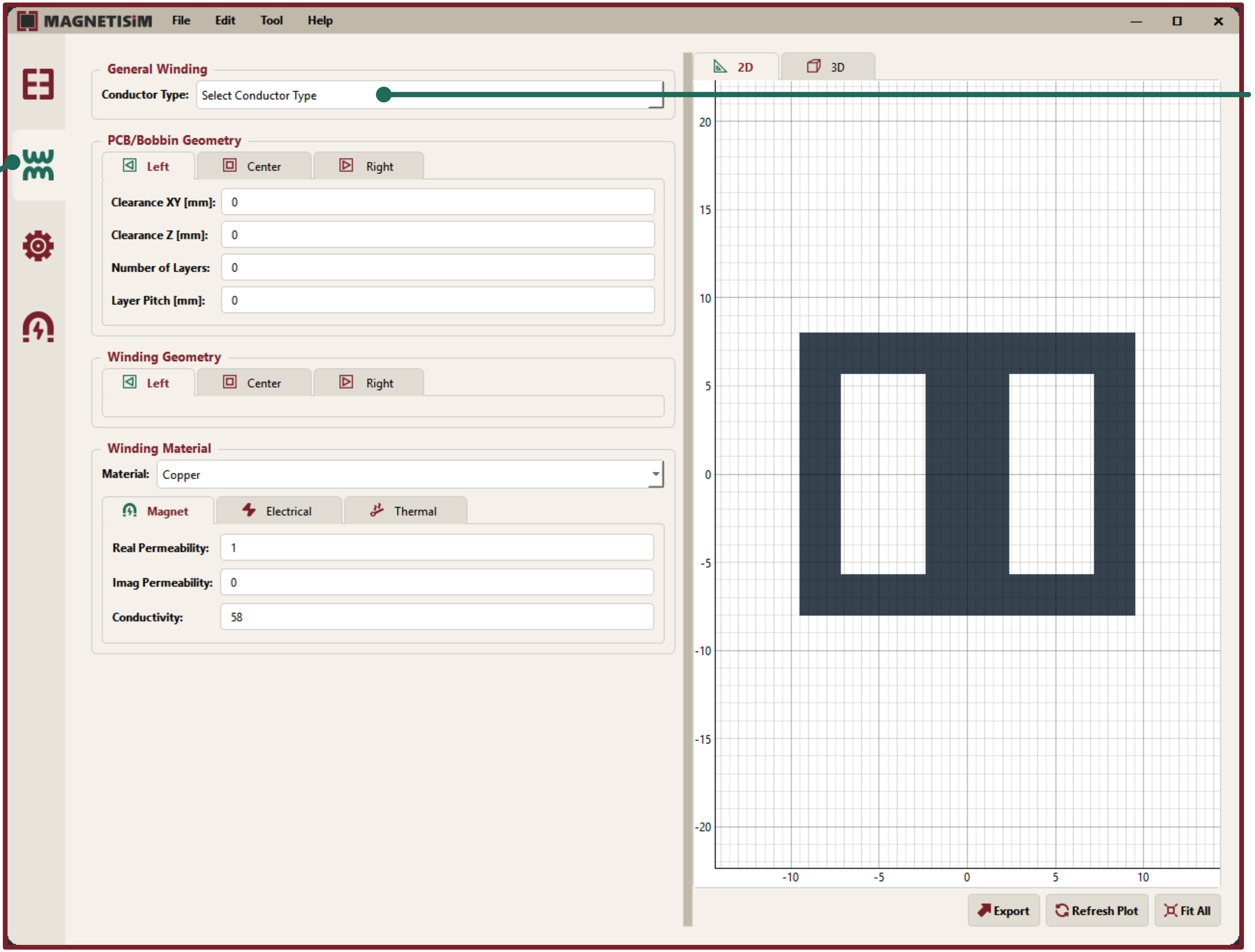


We can easily switch between a **2D view** superimposed on a grid and an **interactive 3D view** of the core we just designed.

WINDING GEOMETRY TAB

`(Ctrl+2)`

Accessing the "Winding Geometry Tab" we proceed to include the coils in our design.

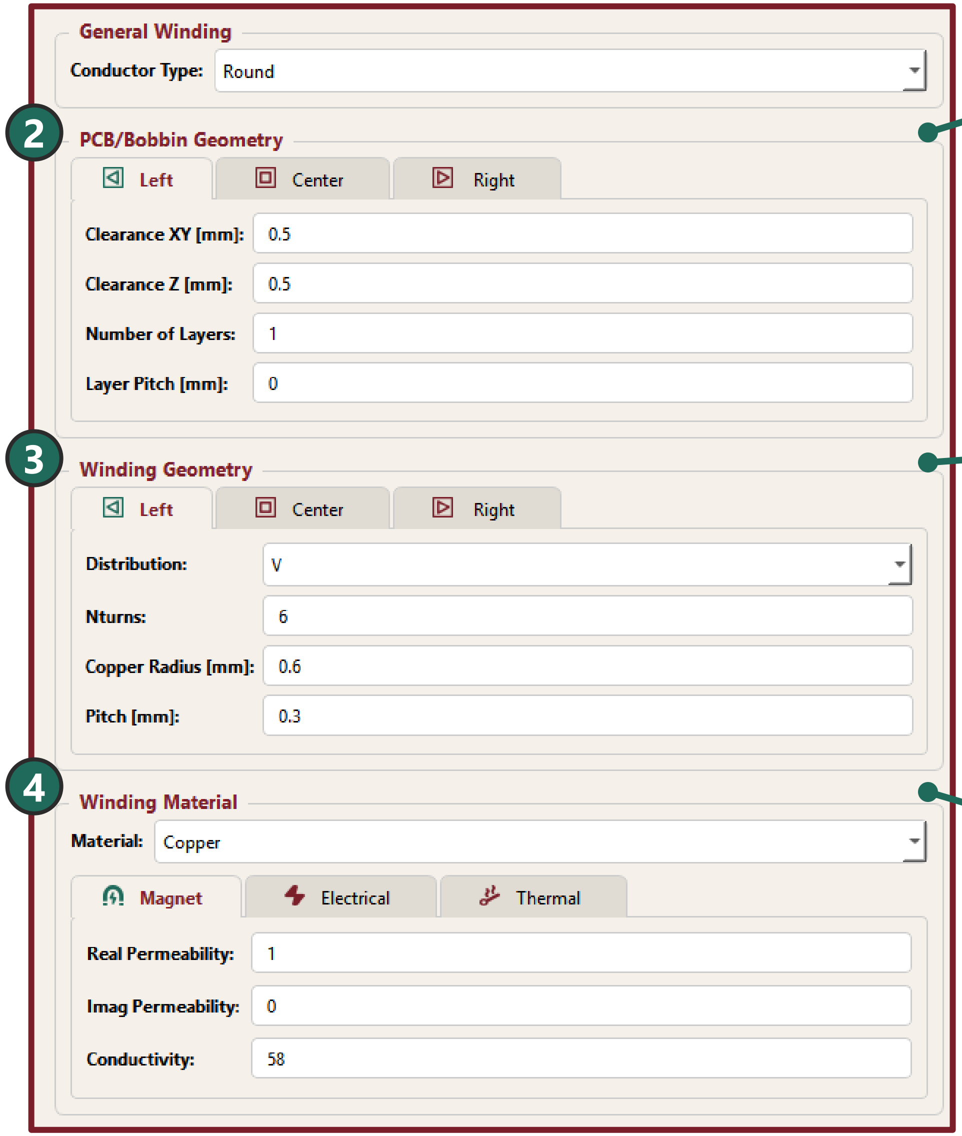


1 GENERAL

We choose the conductor type:

- Round
- PCB/Planar
- Litz

Round Conductors



❷ PCB/BOBBIN GEOMETRY

- **Clearance XY** – This is the safety distance in the horizontal plane between the winding and the core legs.
- **Clearance Z** – This represents the separation along the vertical axis.
- **Number of layers** – Indicates the total amount of layers that will be superimposed to form the winding.
- **Layer Pitch** – This is the vertical distance or separation between one wire layer and the next one.

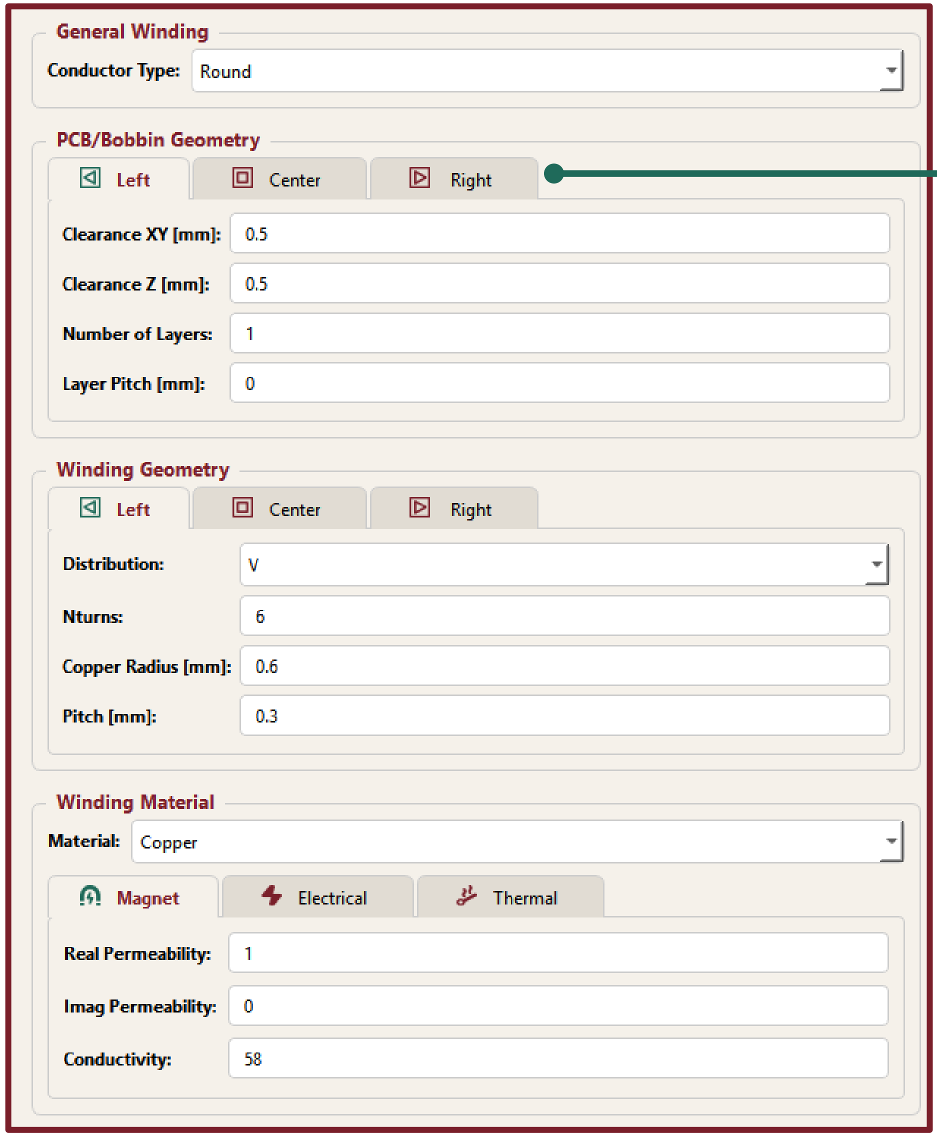
❸ PCB/BOBBIN GEOMETRY

- **Distribution** – Defines the arrangement pattern of the turns (for example, a "V" vertical distribution).
- **Nturns** – The total number of turns or loops of wire that make up the winding.
- **Copper Radius [mm]** – Refers to the physical radius of the solid copper conductor.
- **Pitch [mm]** – The center-to-center distance between two consecutive turns within the exact same layer.

❹ Winding Material

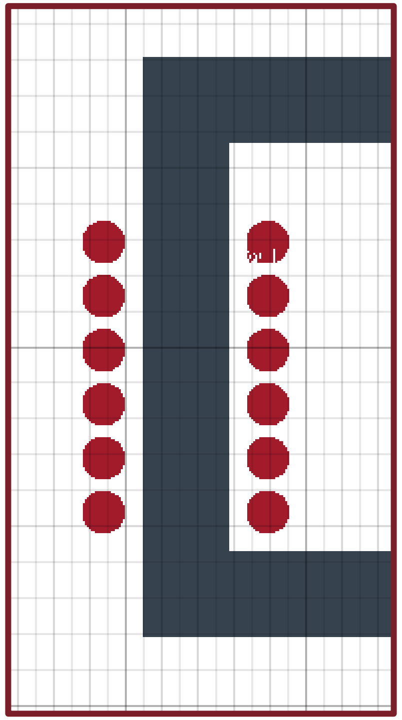
- **Magnet**
- **Electrical**
- **Thermal**

More details in ***Defining Winding***



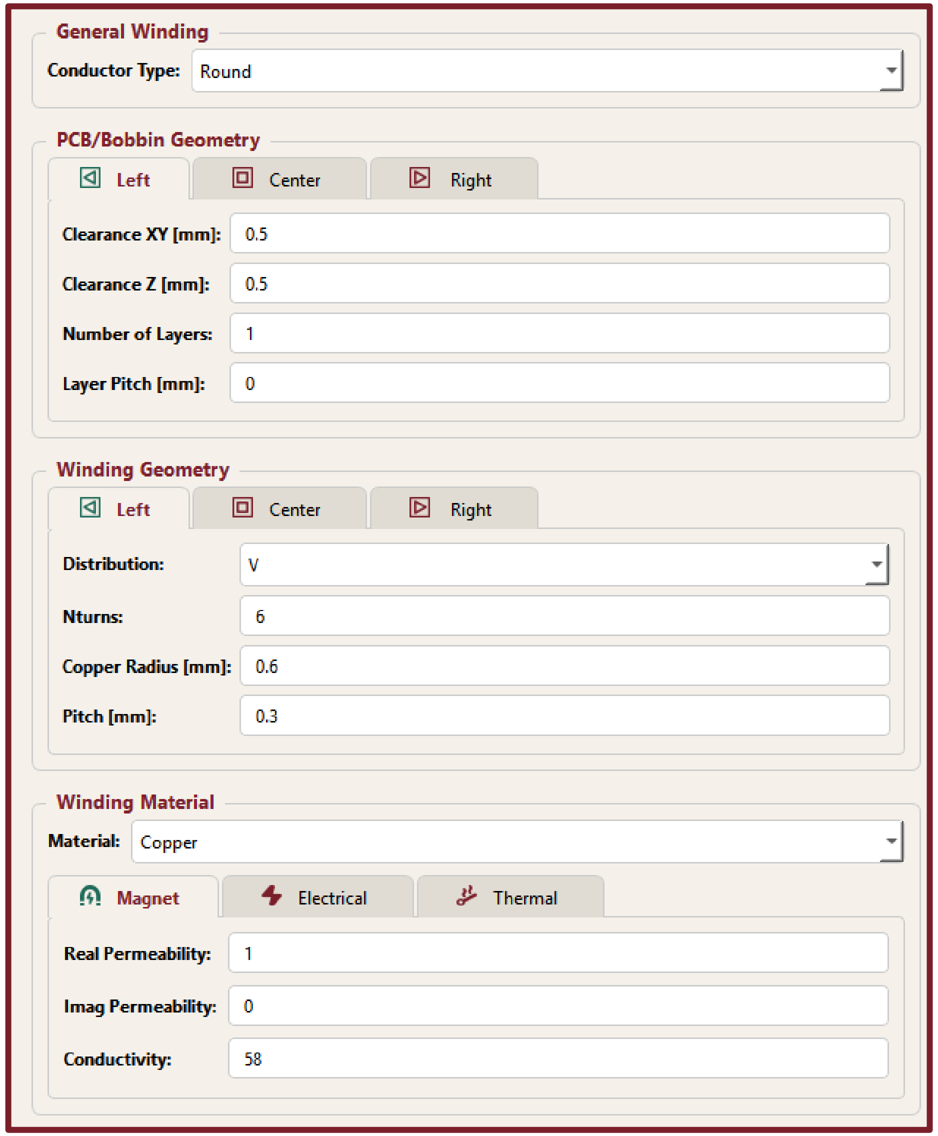
THE TOOL IS VERY VISUAL

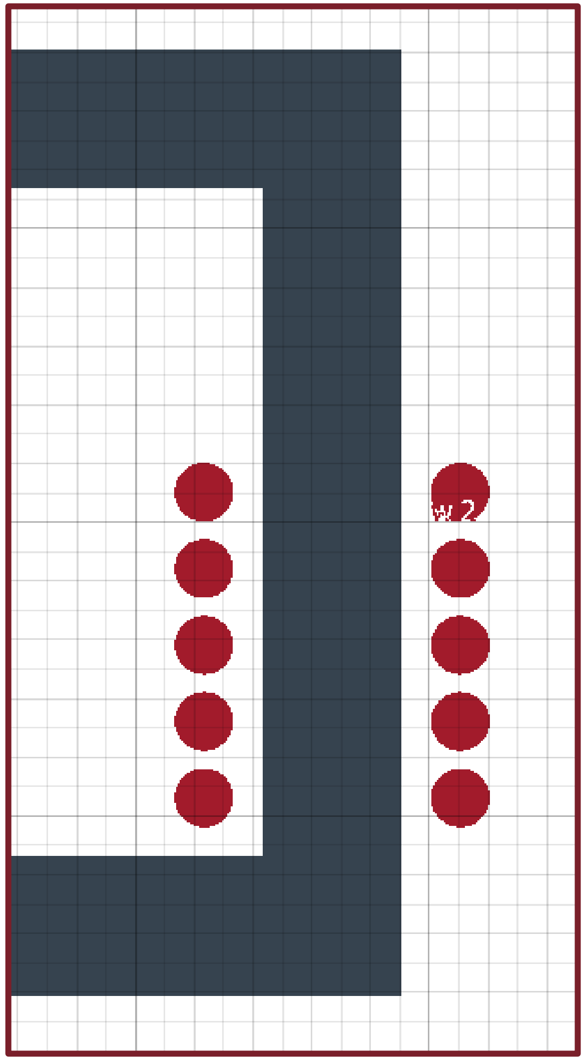
When we change parameters like the layer pitch or play with the legs' position, the 2D **view updates instantly** to show us how the different layers look.



More details in ***Defining Winding***

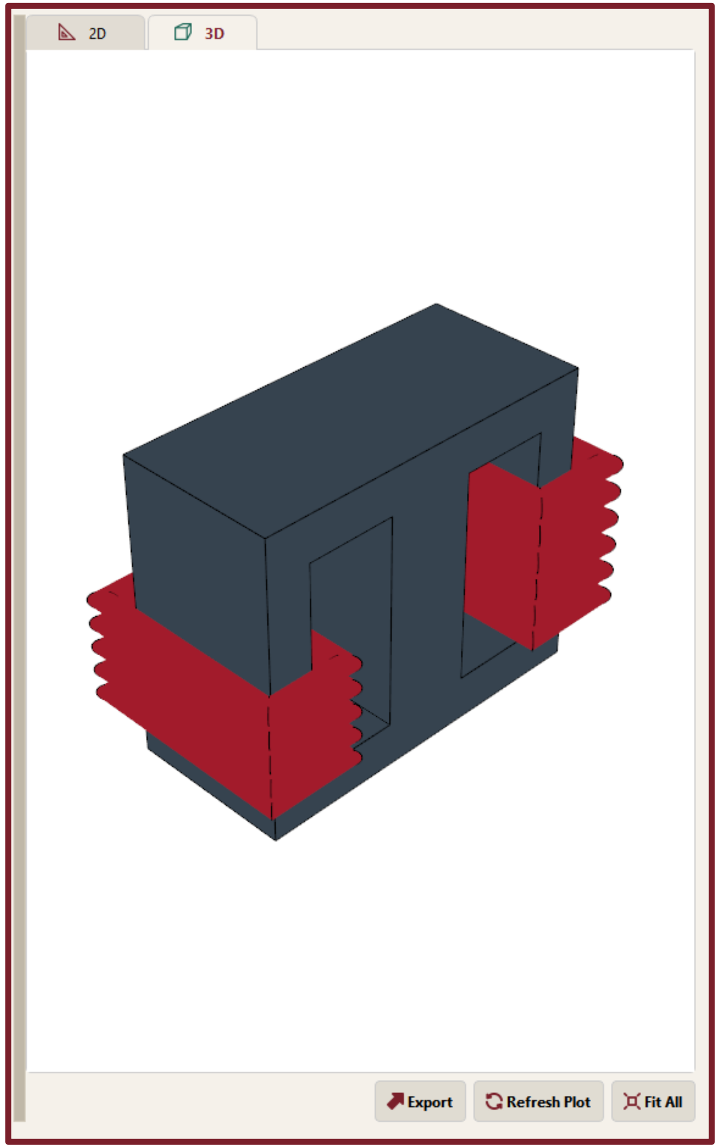
Defining a Winding



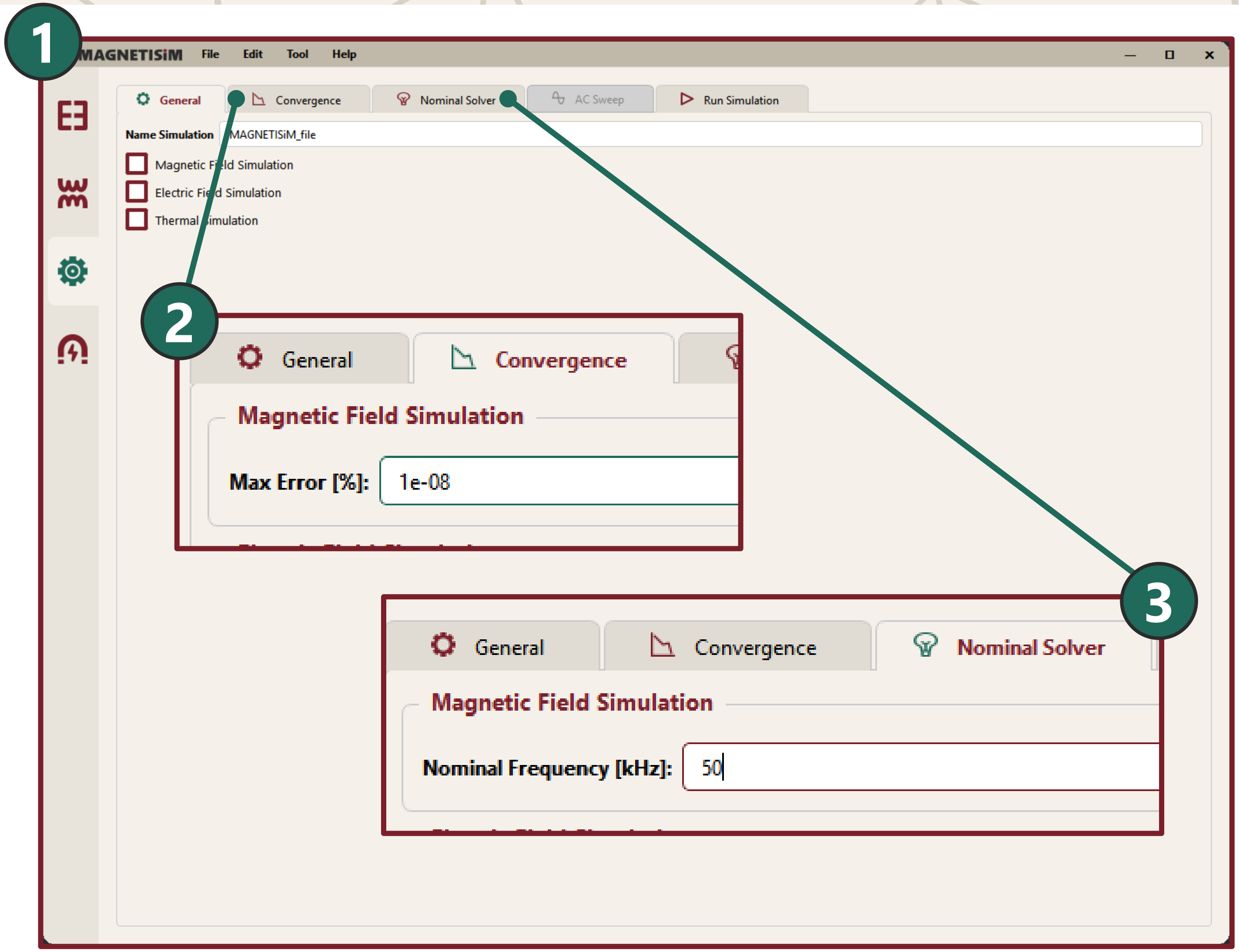


More details in ***Defining Winding***

This Must be the Result



Configure the Simulation



❶ GENERAL

We assign a simulation name and select the desired simulations:

- Magnetic Field
- Electric Field
- Thermal Simulation

❷ CONVERGENCE

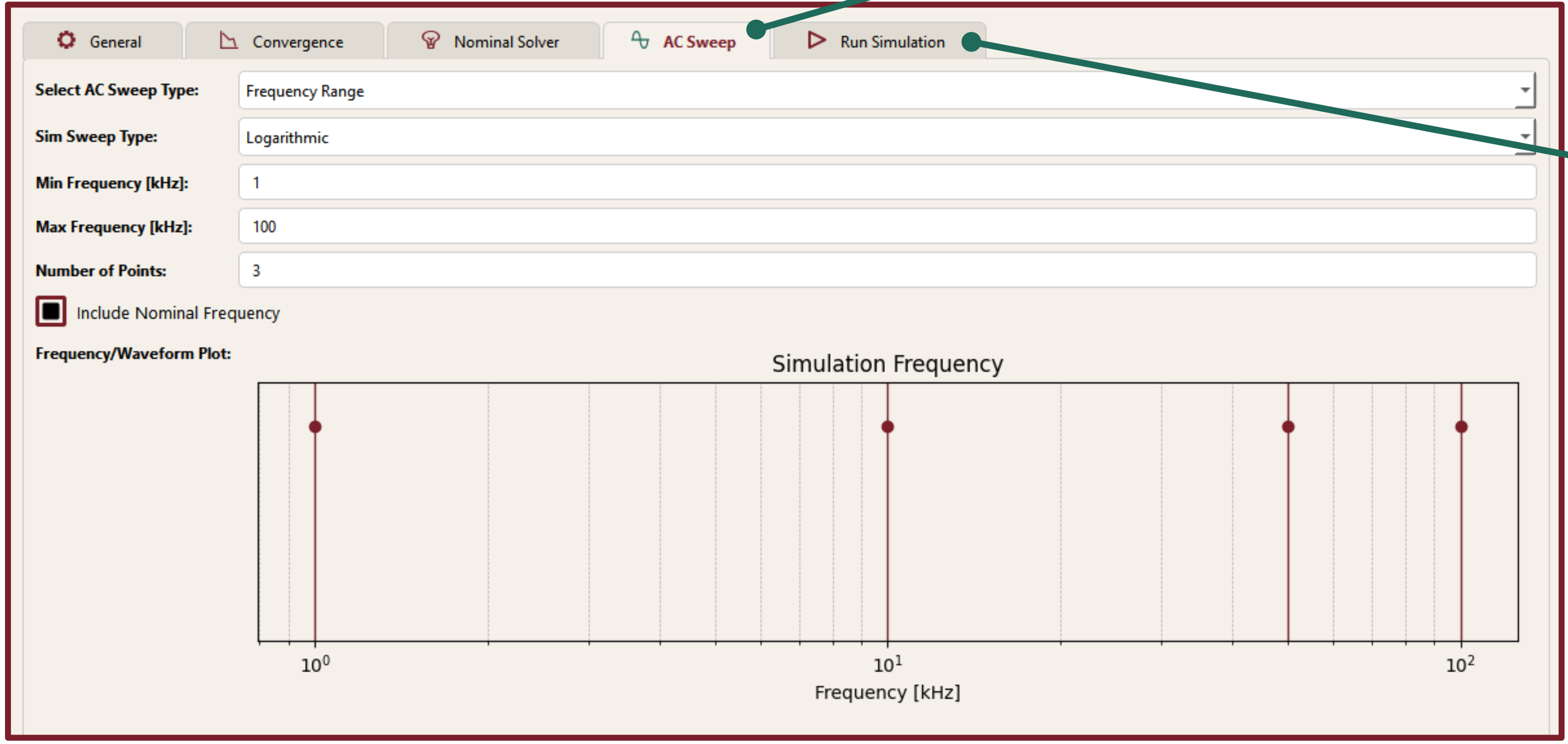
We define the mathematical precision criteria, such as the maximum error.

❸ NOMINAL SOLVER

We adjust the nominal frequency of the system.

More details in ***Configure Sim***

Configure the Simulation



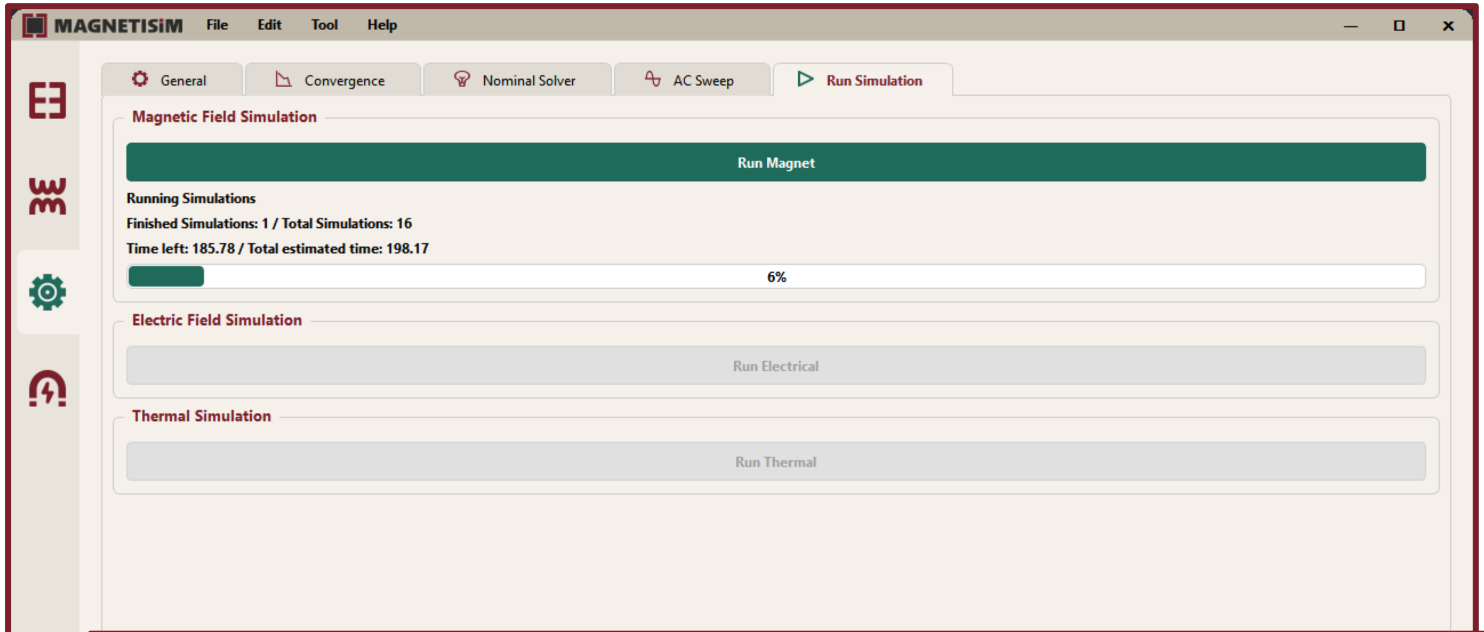
4 AC SWEEP

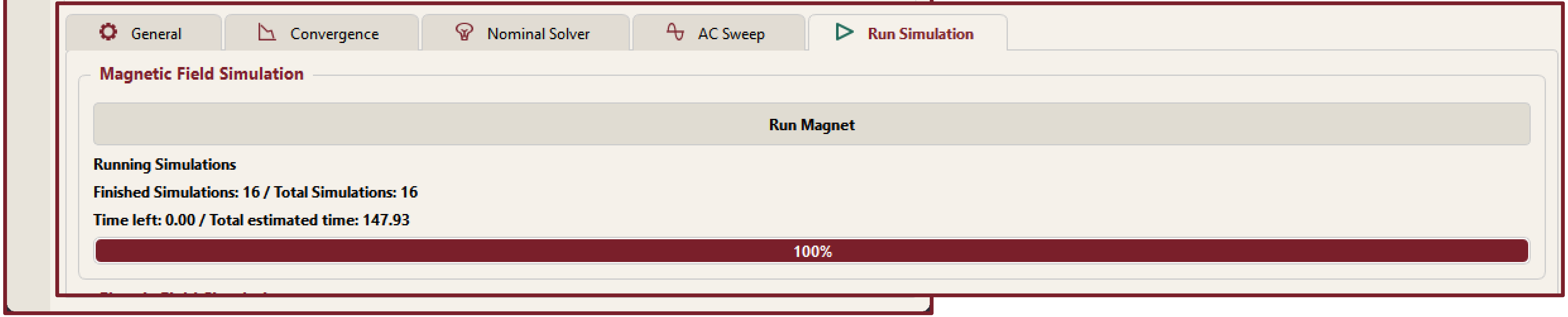
We configure a frequency sweep, being able to select the sweep type (e.g., logarithmic) and defining the min and max frequencies to see the behavior over a broad spectrum.

5 RUN SIMULATION

Well, to run the simulation.

More details in ***Configure Sim***



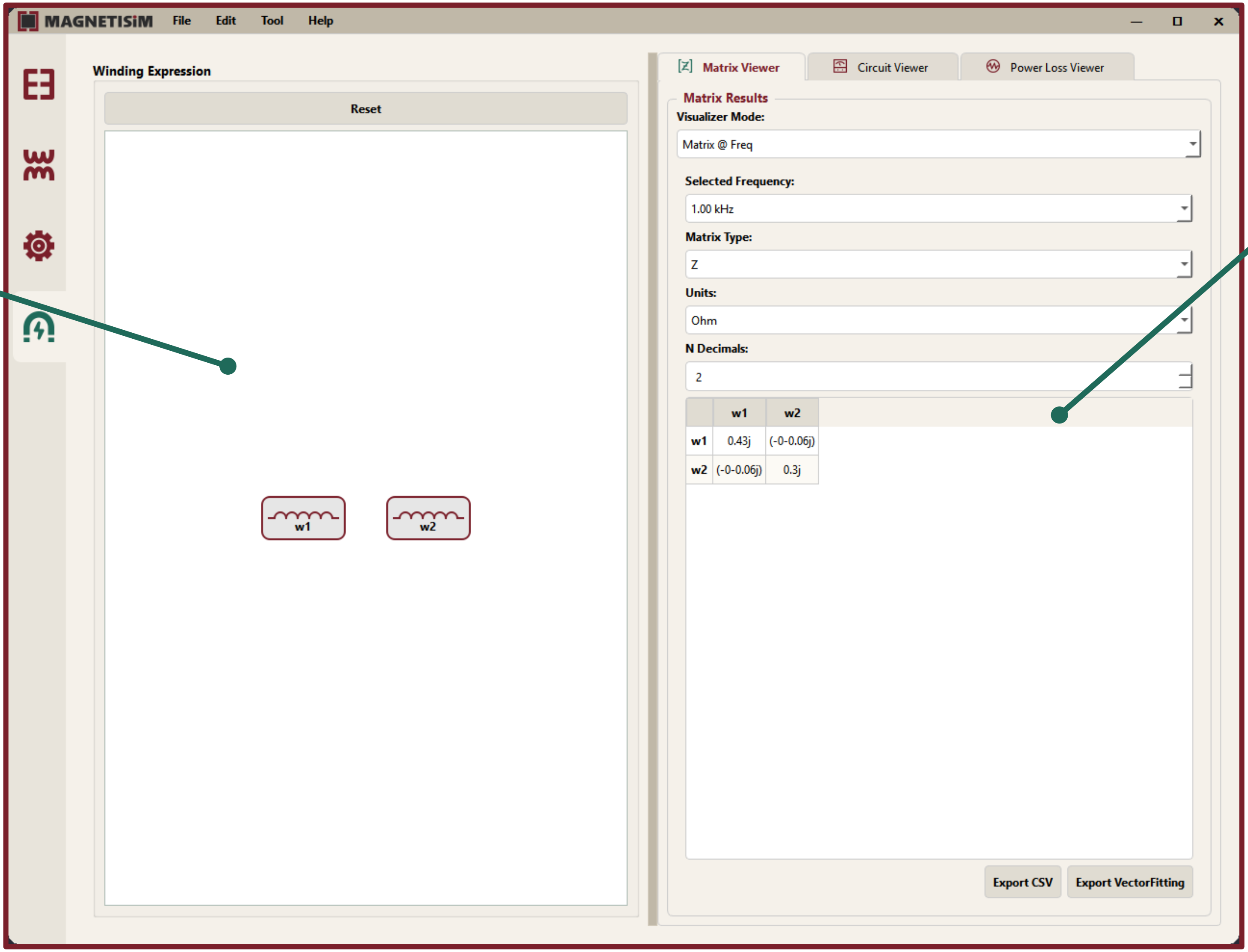


When launching the simulation in the **Run Simulation tab** (`Ctrl+3`), the interface locks momentarily to dedicate all resources to the field calculations.

The development team promises this will be improved!

You can follow the progress using a bar. Once the red bar reaches 100% and finishes counting, the results can be viewed.

Results Viewer (`Ctrl+4`)



WINDING EXPRESSION WINDOW

In the "Winding Expression" window, we can right-click on the windings to define a series or parallel connection.

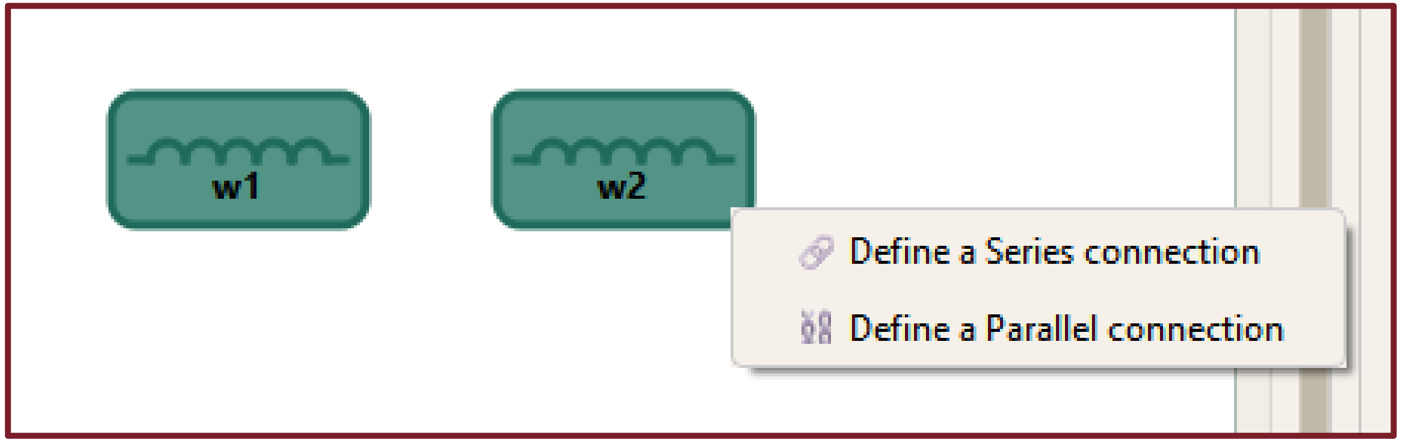
RESULTS WINDOW

With the **Visualizer Mode**, we select how we want to view the data.

We can filter the data by selecting a specific frequency, the matrix type, and adjusting the units and the number of decimals plotted.

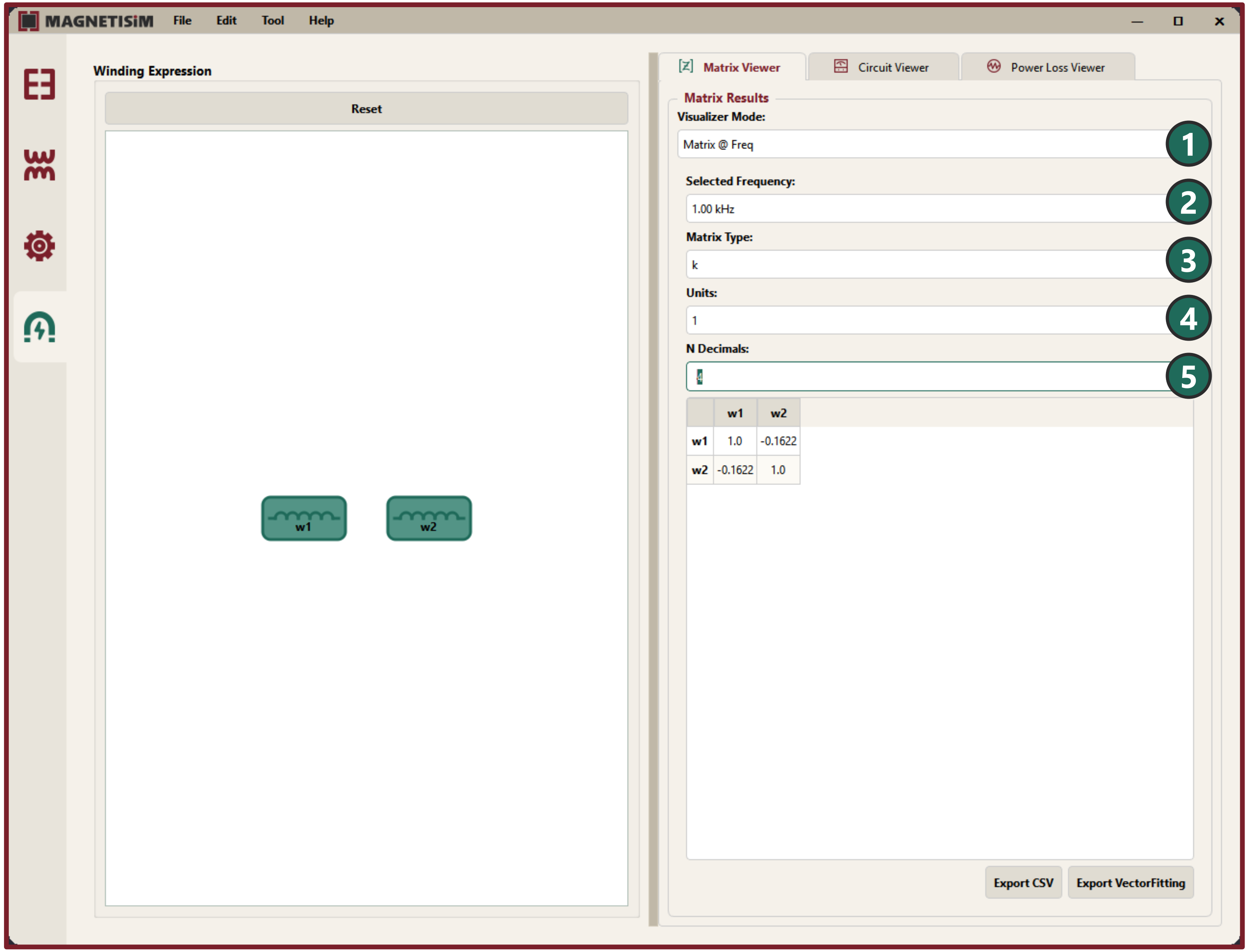
More details in ***Analysing Results***

Winding Manager (per Layer)



More details in ***Analysing Results***

Matrix Viewer



❶ VISUALIZER MODE

Determines how the matrix data is presented on the screen. For example, setting it to "**Matrix @ Freq**" allows you to view the data table for one specific frequency.

❷ SELECTED FREQUENCY

The specific frequency point (e.g., 1.00 kHz) from your simulation sweep that you want to examine in the matrix.

❸ MATRIX TYPE

Selects the specific electrical or magnetic parameter you want to analyze. In the image, 'k' is selected, which represents the coupling coefficient between the windings.

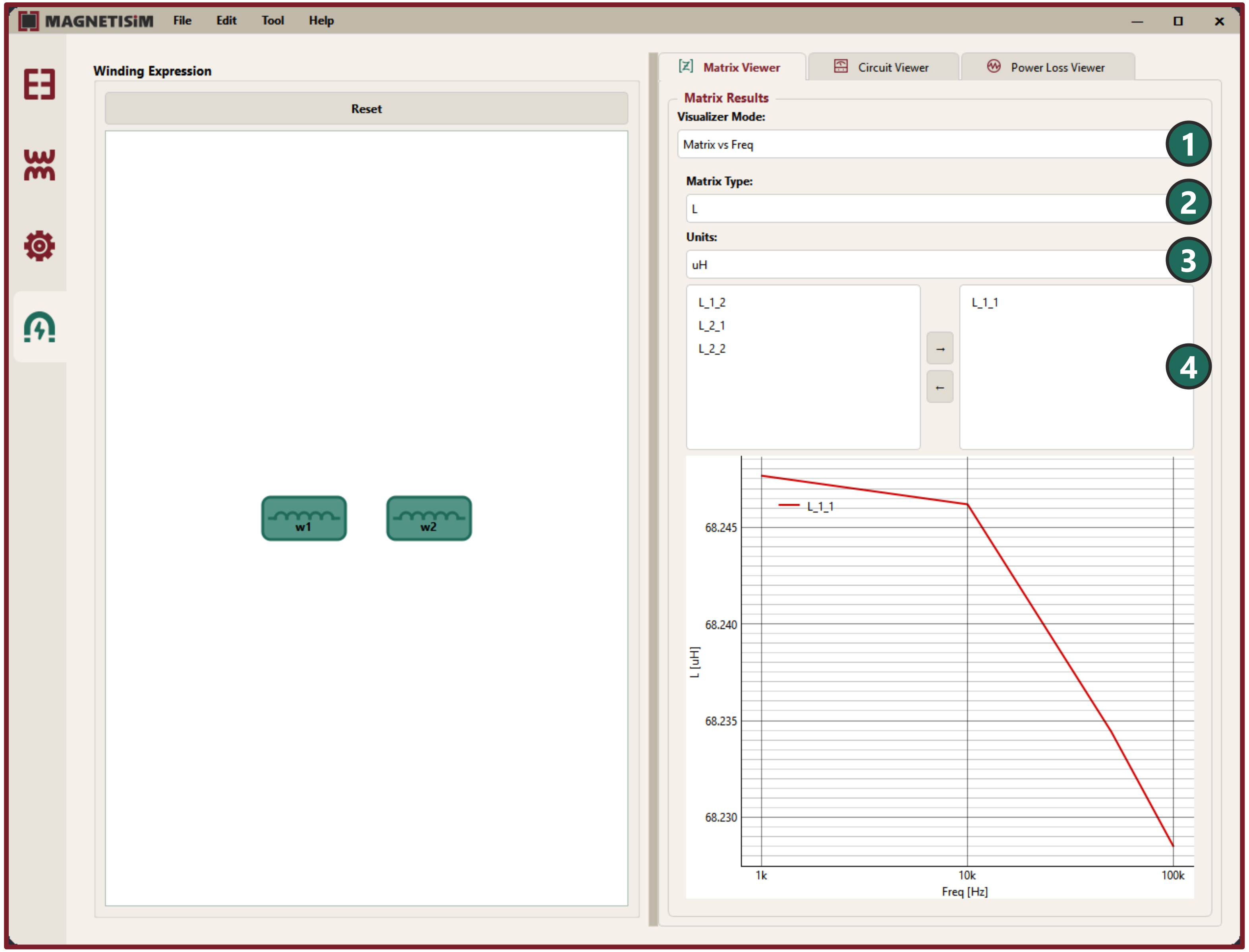
❹ UNITS

The physical measurement units applied to the values within the matrix. For the coupling coefficient ('k'), it is represented as a dimensionless unit ('1').

❺ N DECIMALS

Controls the visual precision of the data by defining the exact number of decimal places shown for the numerical values inside the generated matrix.

More details in ***Analysing Results***



❶ VISUALIZER MODE

Determines how to display the data. By setting it to "**Matrix vs Freq**", the viewer changes from a data table to a 2D graph, allowing you to observe how a specific parameter behaves across the entire simulated frequency range (AC Sweep).

❷ MATRIX TYPE

Selects the specific electrical or magnetic parameter you want to evaluate. In the image provided, 'L' is selected, meaning the graph will display Inductance values.

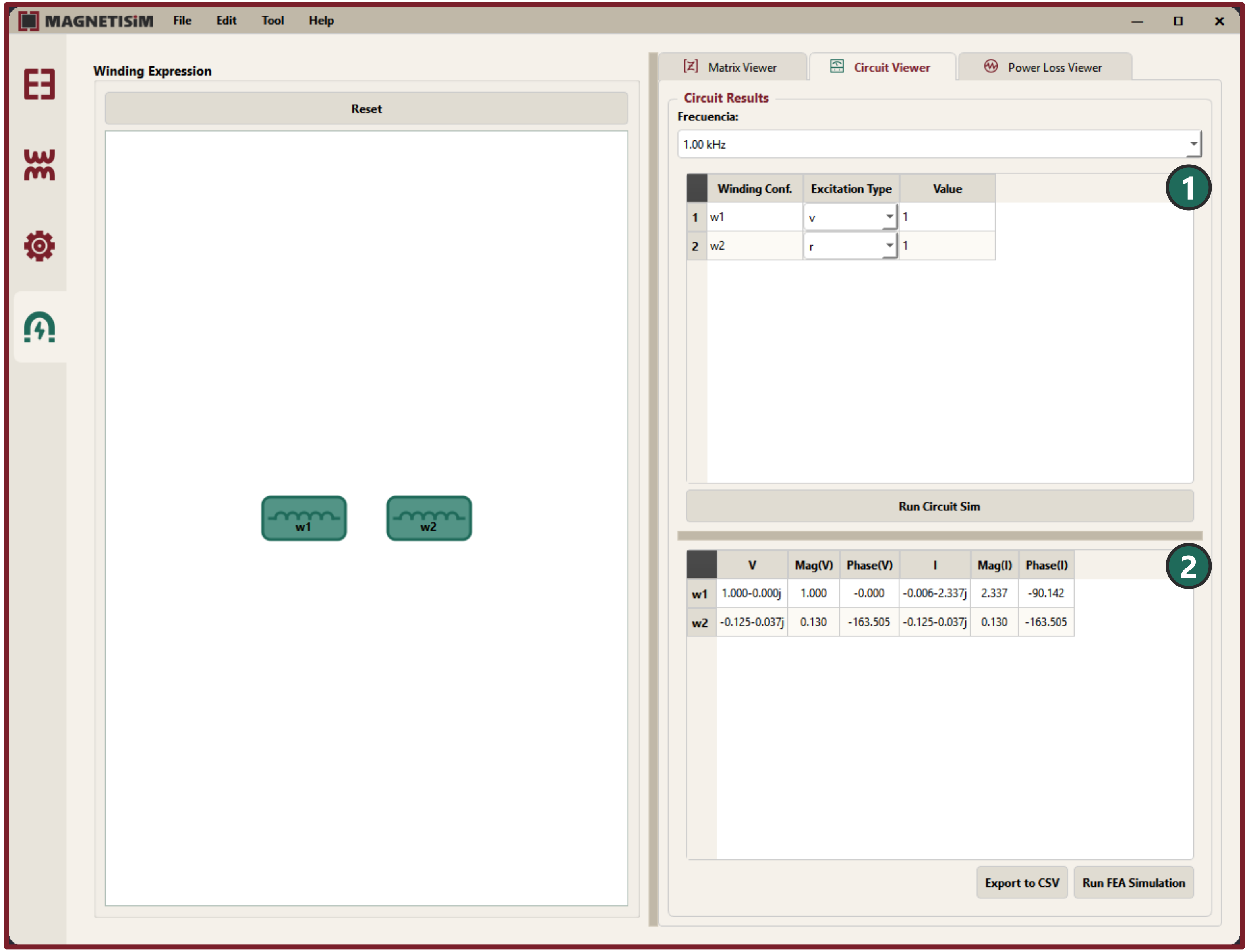
❸ UNITS

Sets the physical measurement unit for the graph's vertical axis (Y-axis). For the chosen inductance, it is configured to 'uH' (microhenries).

❹ DATA TO PLOT

This selection area lets you choose exactly which elements from the matrix you want to render on the graph. You can select individual matrix components—such as a specific self-inductance or mutual inductances—and use the arrow buttons to add or remove them from the active plot.

More details in ***Analysing Results***



CIRCUIT VIEWER

The Circuit Viewer is designed for direct electrical analysis.

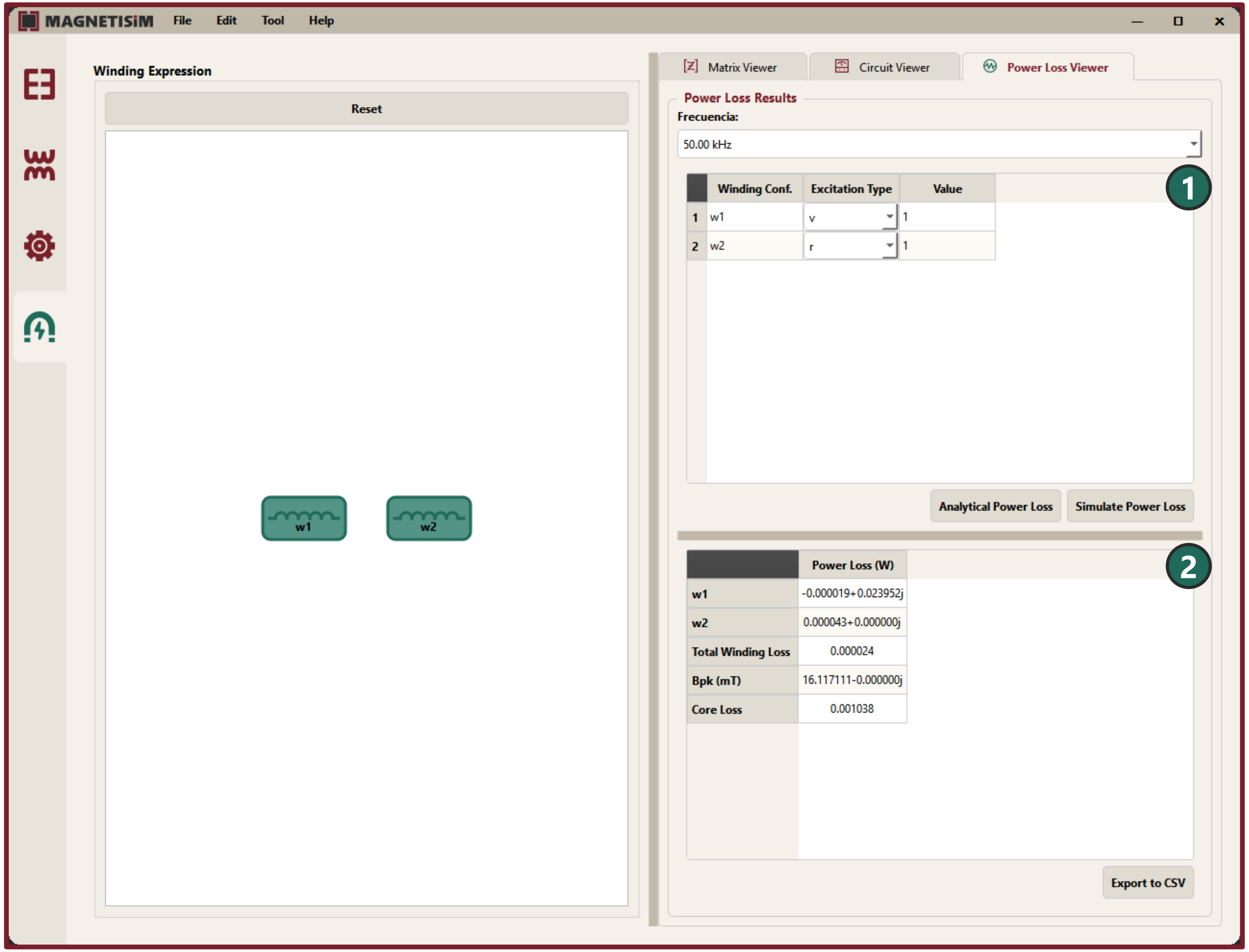
❶ Frequency, Winding Conf, Excitation Type, Value

You just need to select the frequency and apply a configuration to your windings including Winding Conf, Excitation Type, and Value.

❷ Run Circuit Sim

By clicking "Run Circuit Sim", the program returns the electrical data, solving the circuit and showing you the results layer by layer.

More details in ***Analysing Results***



POWER LOSS VIEWER

The Power Loss Viewer is designed for direct power loss analysis.

❶ Frequency, Winding Conf, Excitation Type, Value

Similar to the circuit viewer, you input the frequency, the excitation type, and its value.

❷ Run Circuit Sim

Then you can calculate the losses by clicking on "Analytical Power Loss" or "Simulate Power Loss".
You will see the results broken down per layer, including total winding loss and core loss.

More details in ***Analysing Results***

03

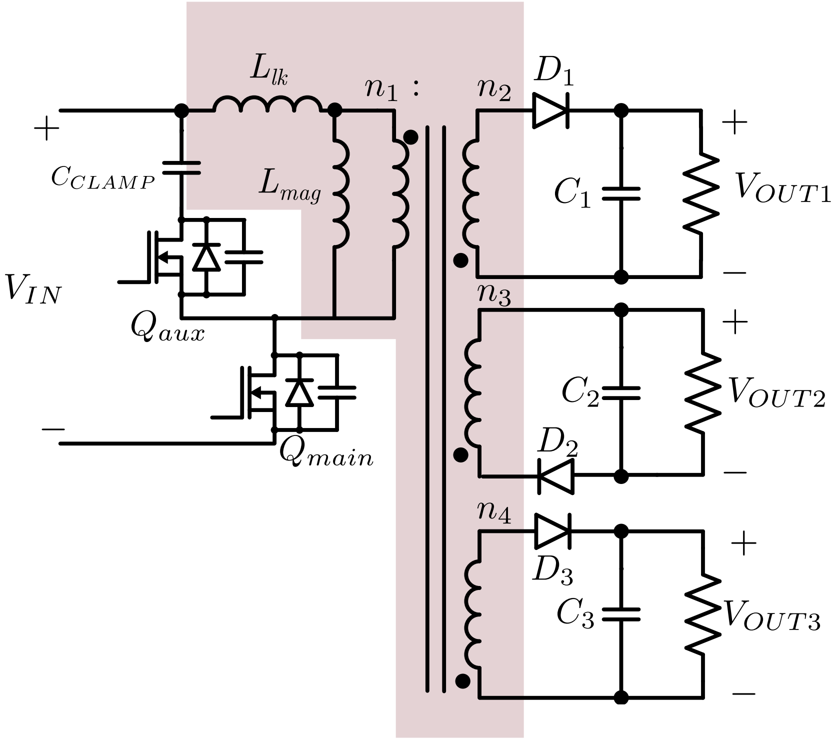
Use-Case

- Project Context
- Design Configuration
- Simulation and Evaluation

Specifications

- ✗ Parasitic Capacitance → **CAPACITISiM**
- ✗ PCB Design → **PCBSiM**

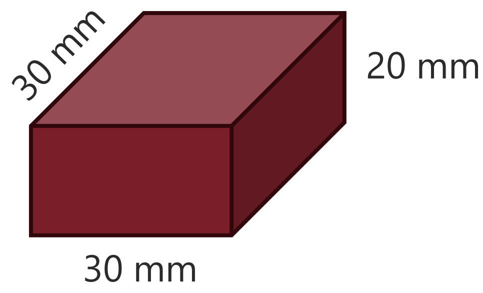
- ✓ Manufacturer process
- ✓ Simulation = Measurements

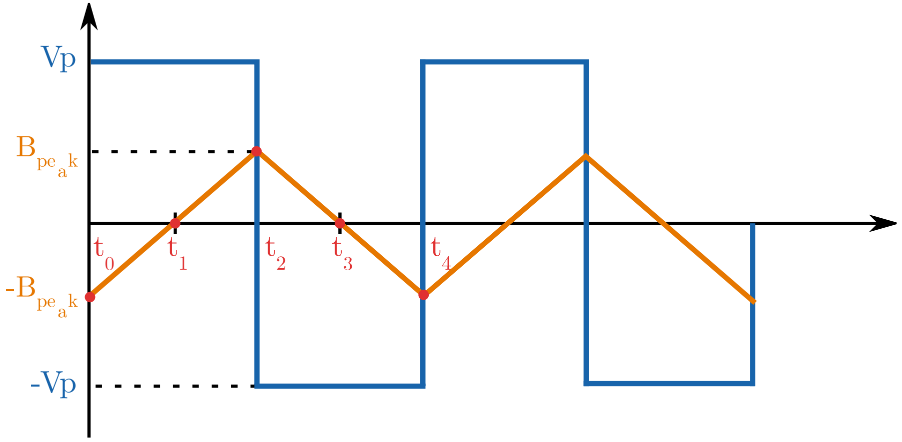


VOLTAGE–POWER SPECIFICATION		
Port	**Parameter**	**Value**
Input	V_{in}	42 V
	f_{sw}	350 kHz
Output 1*	V_{out}	6 V
	P_{out}	10 W
Output 2	V_{out}	-6 V
	P_{out}	1.5 W
Output 3	V_{out}	9 V
	P_{out}	20 W

Operating frequency: 350 kHz

FORM FACTOR



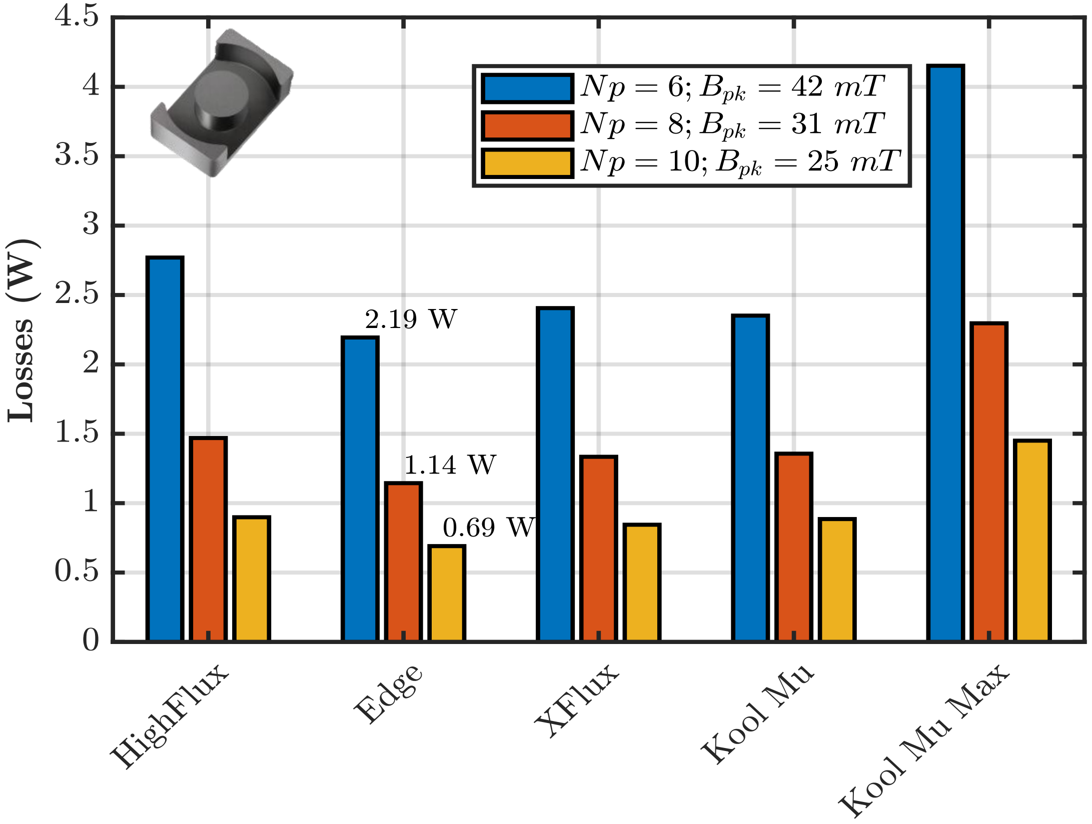


$$\frac{\partial \emptyset}{\partial t} = \frac{V}{N} \rightarrow B_{pk} = \frac{V_p}{A_{eff} N_p} \cdot \frac{1}{4 f_{sw}}$$

$$\Delta I \rightarrow L_{mag} \approx \frac{A_{eff}}{l_{eff}} N_p^2 \mu_r \mu_0 \approx 8\mu H$$

EXPERTISiM

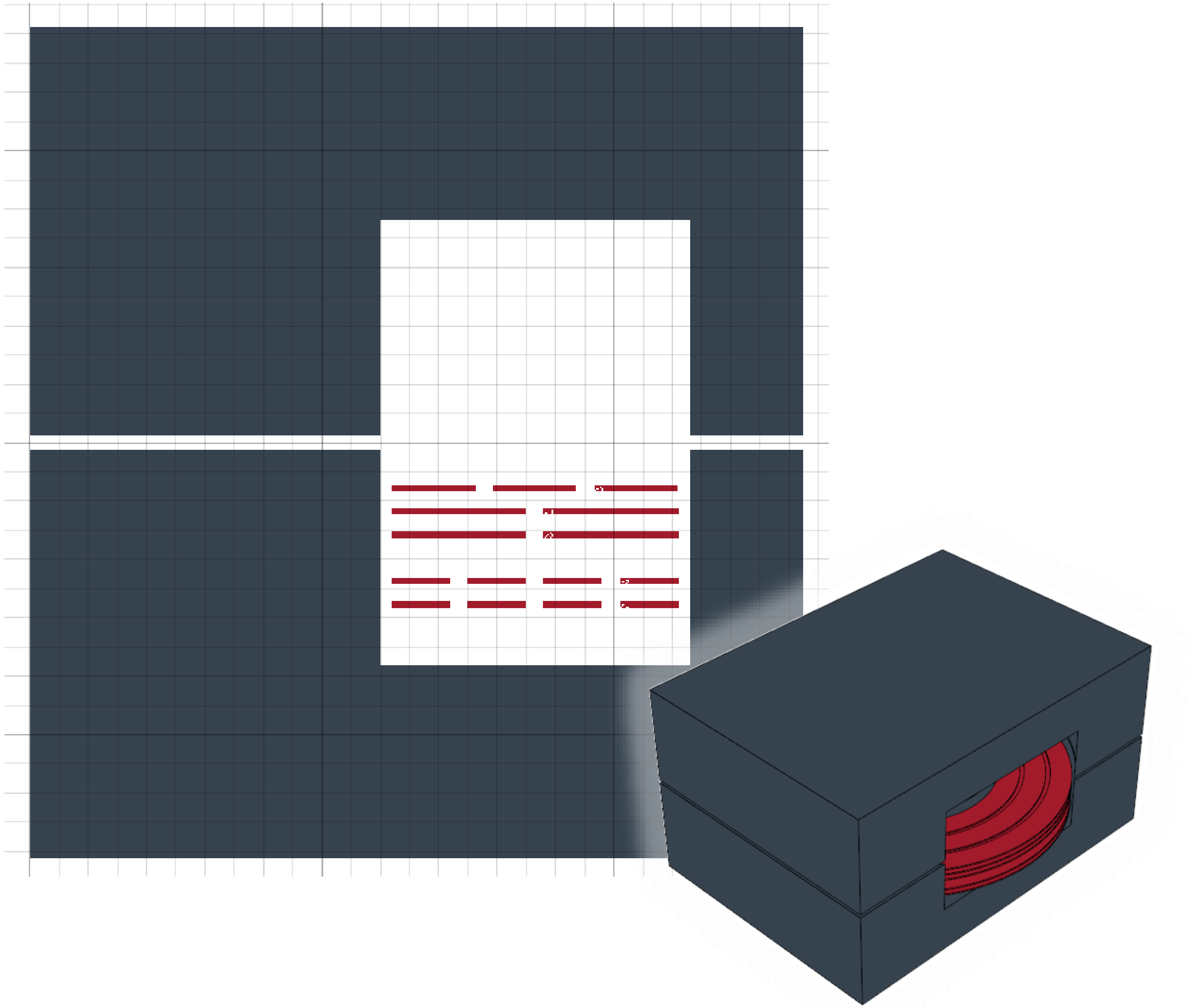
MAGNETICS



Preliminary Design

WINDING SPECIFICATIONS		
Port	Layer ID	No. Turns
Input	w1	4
	w2	4
Output 1	w3	2
Output 2	w4	2
Output 3	w5	3

EXPERTISiM



$$A_L \approx \frac{8\ \mu H}{8^2} \approx 125\ nH$$

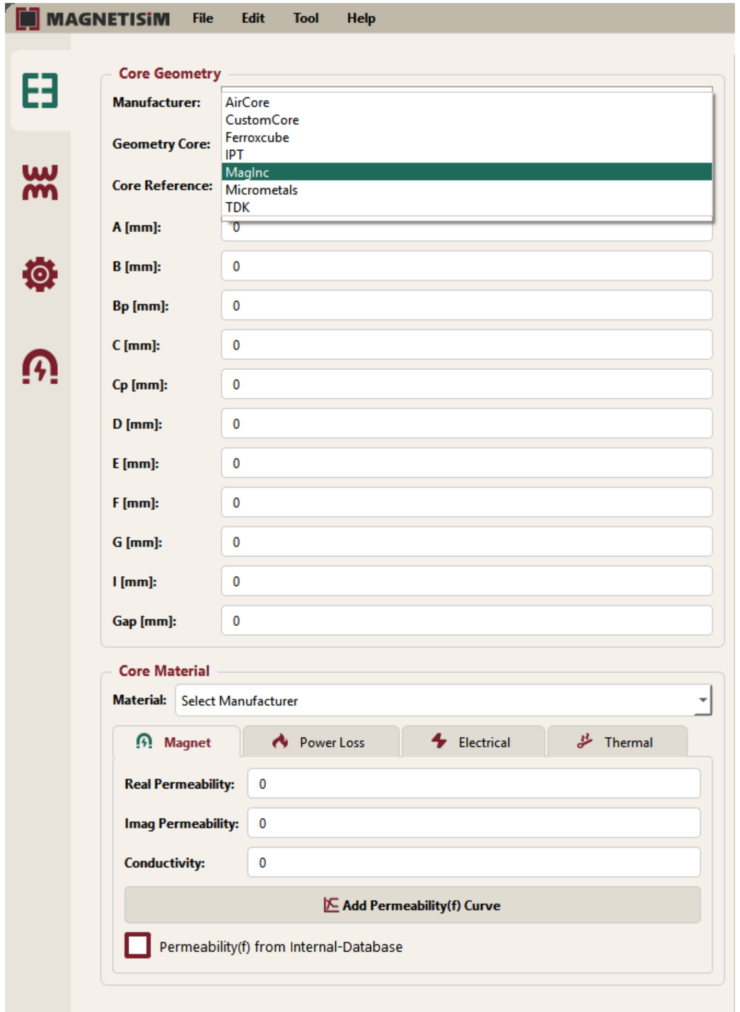
Edge Toroids | E Cores | U Cores | **EQ Cores** | LP Cores | EER Cores | Blocks

Core Data	A_L nH/T² (nominal)			L_e Path Length mm	A_e Cross Section mm²	Length mm	Height mm	Width mm
	26µ	40µ	60µ					
EQG20 L050	81	120	167	29.3	60.8	20.0	5.0	14.0
EQG20 L061	67	98	138	35.8	60.8	20.0	6.1	14.0
EQG26 L070	111	164	228	42.3	119.8	26.5	7.0	19.0
EQG26 L088	95	140	195	49.5	119.8	26.5	8.8	19.0
EQG26 L101	86	127	177	54.7	119.8	26.5	10.1	19.0
EQG26 L124	74	108	151	63.9	119.8	26.5	12.4	19.0
EQG32 L101	100	148	207	59.5	152.3	32.0	10.1	22.0
EQG32 L152	75	110	156	79.9	152.3	32.0	15.2	22.0
EQG32 L180	66	97	136	91.1	152.3	32.0	18.0	22.0
EQG36 L100	109	160	223	65.1	180.8	36.0	10.0	26.0
EQG36 L110	102	151	211	69.1	180.8	36.0	11.0	26.0
EQG36 L174	75	110	154	94.7	180.8	36.0	17.4	26.0
EQG41 L120	94	138	193	83.6	199.7	41.5	12.0	28.0
EQG41 L199	68	100	140	115.2	199.7	41.5	19.9	28.0
EQG50 L200	109	160	223	113.4	314.1	50.0	20.0	32.0
EQG50 L250	92	136	190	133.4	314.1	50.0	25.0	32.0

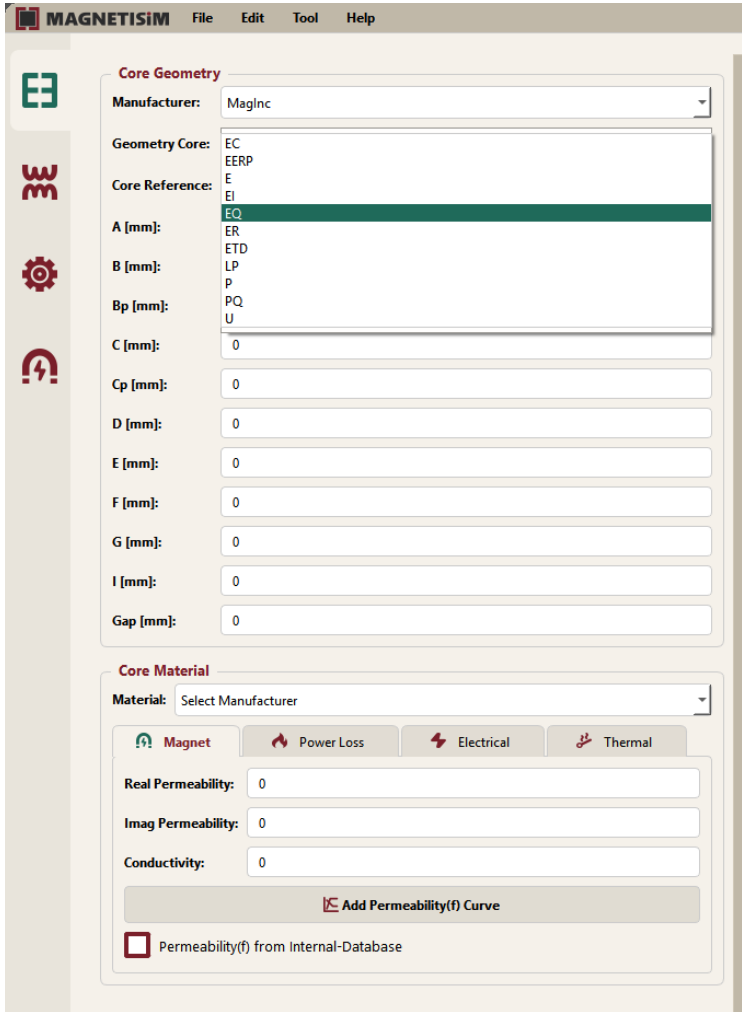
Design Configuration

Core Geometry

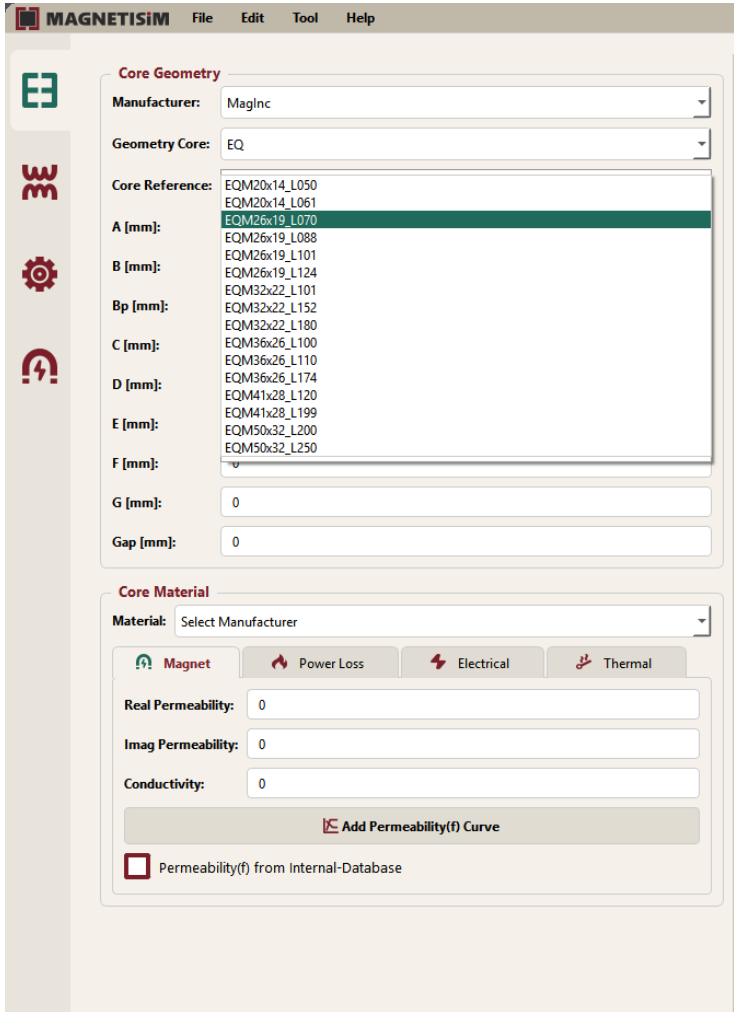
Manufacturer: **MagInc**



Geometry Core: **EQ**



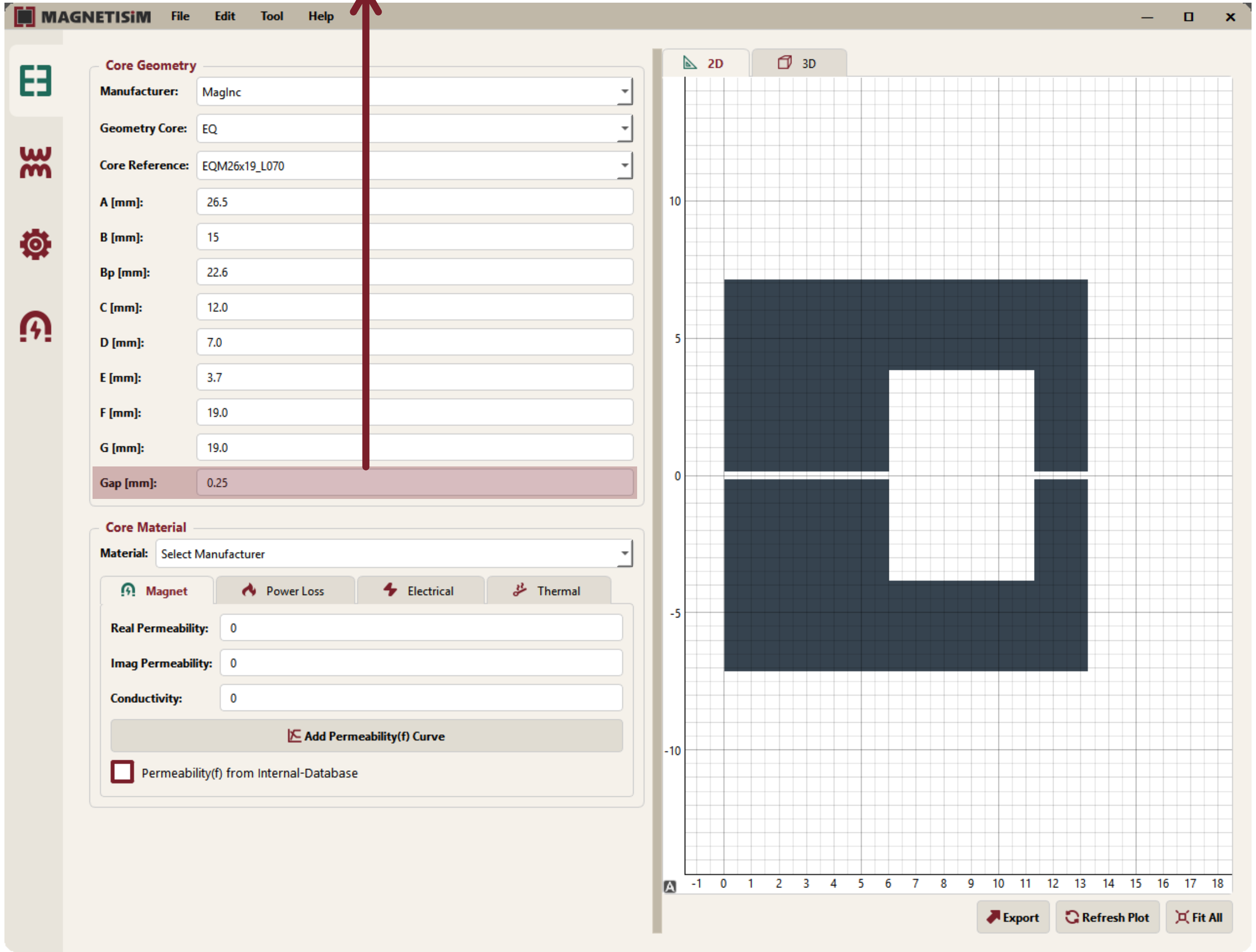
Core Reference: **EQM26x19_L070**

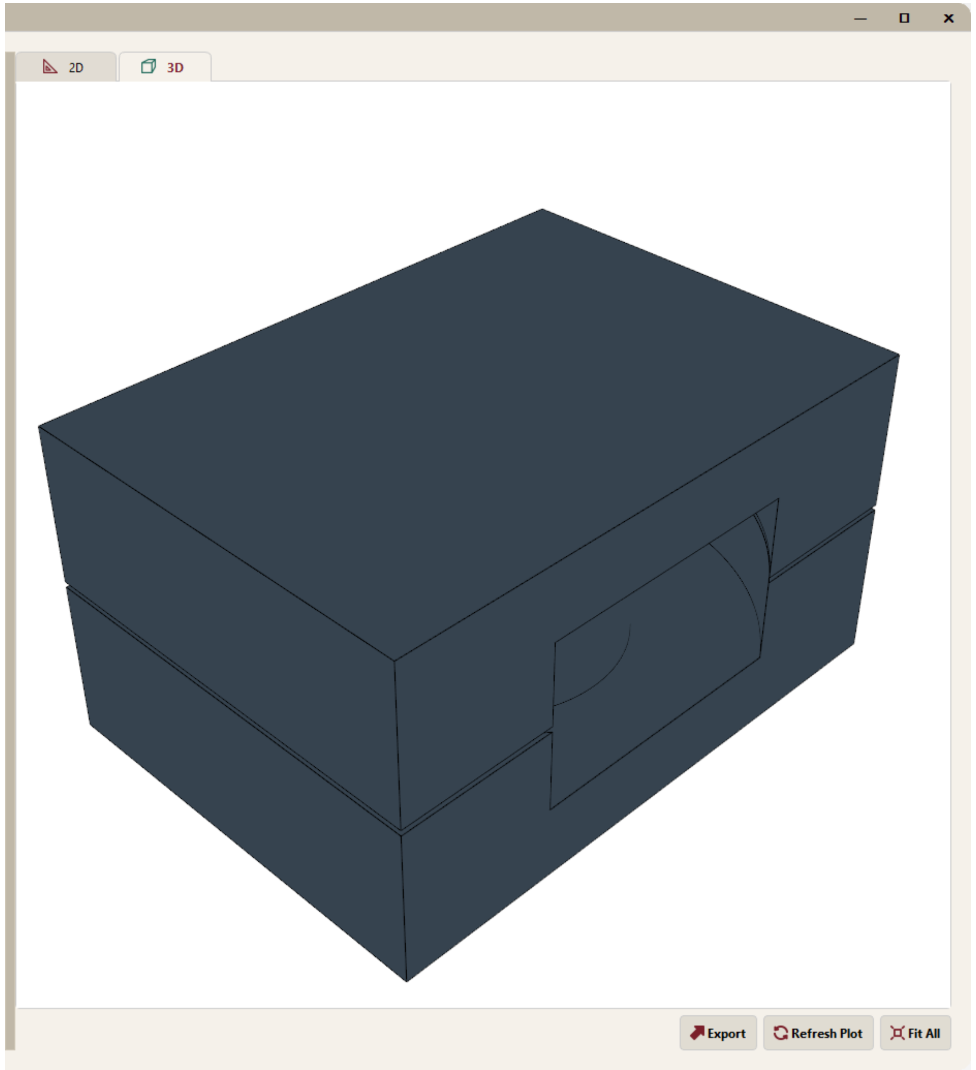


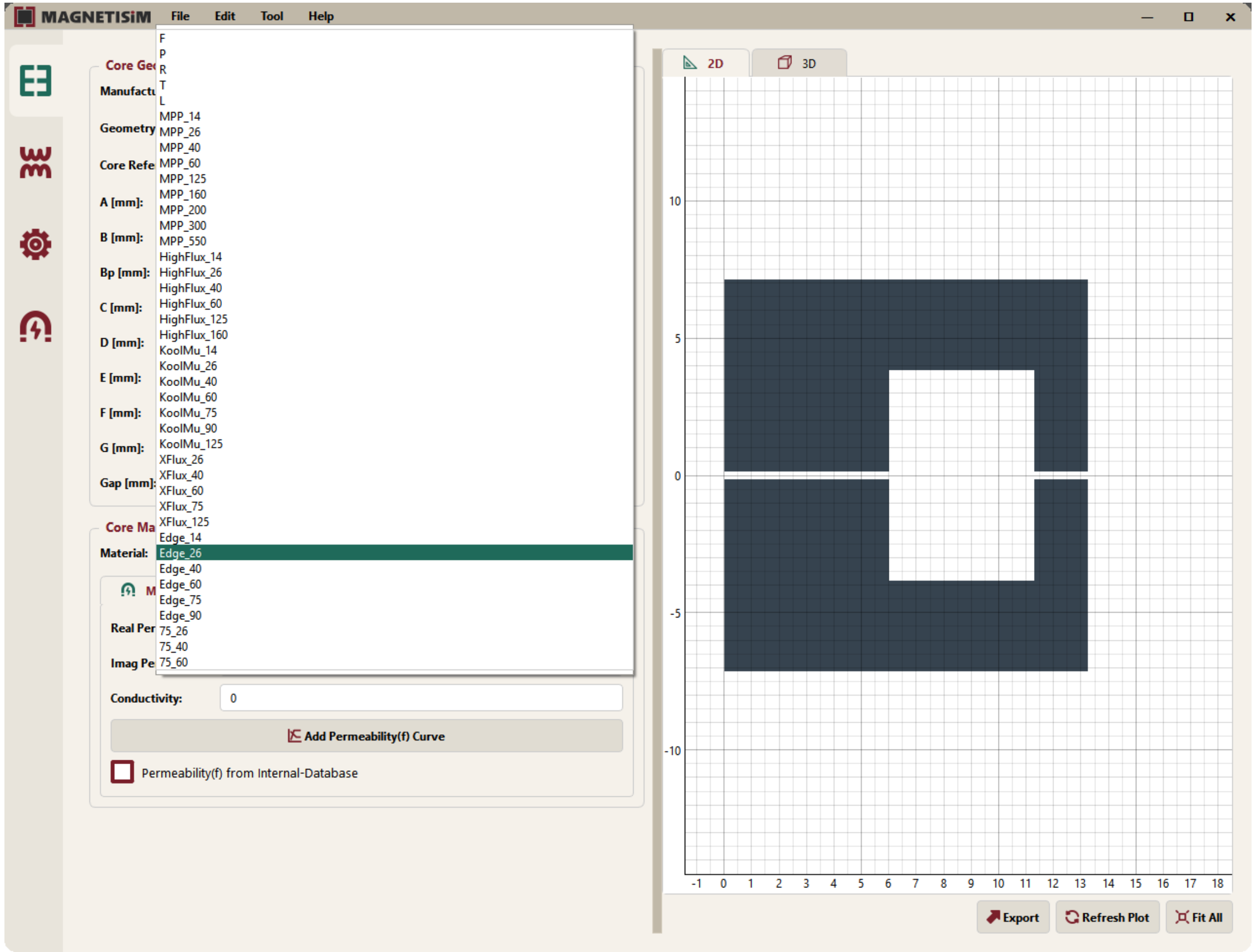
Design Configuration

Core Modification

Gap [mm]: **0.25**

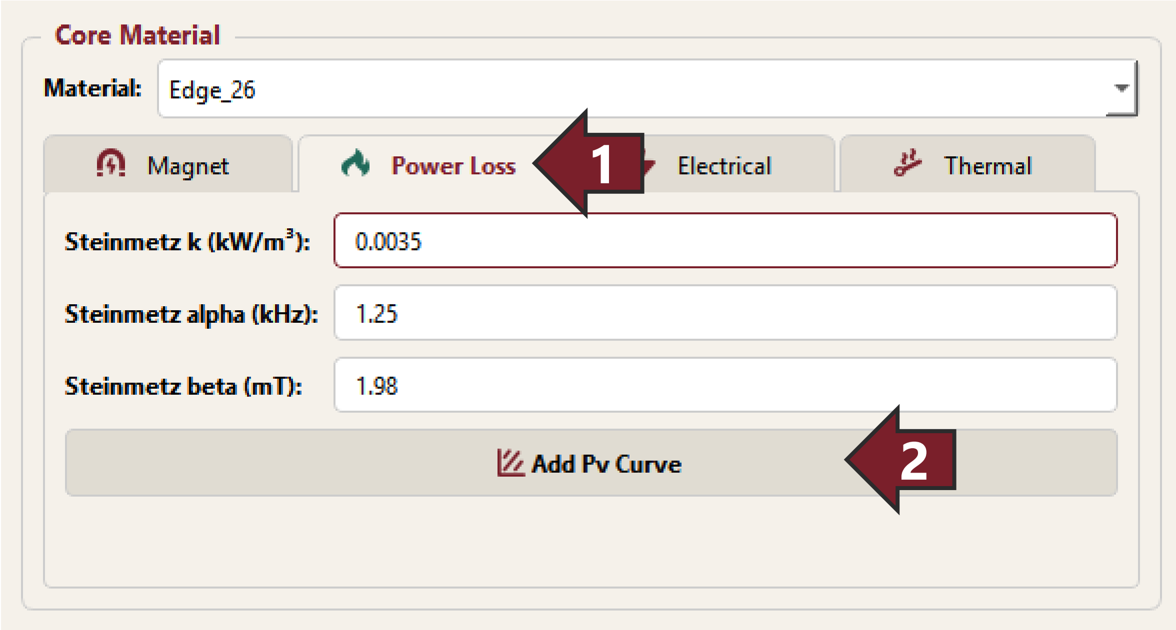


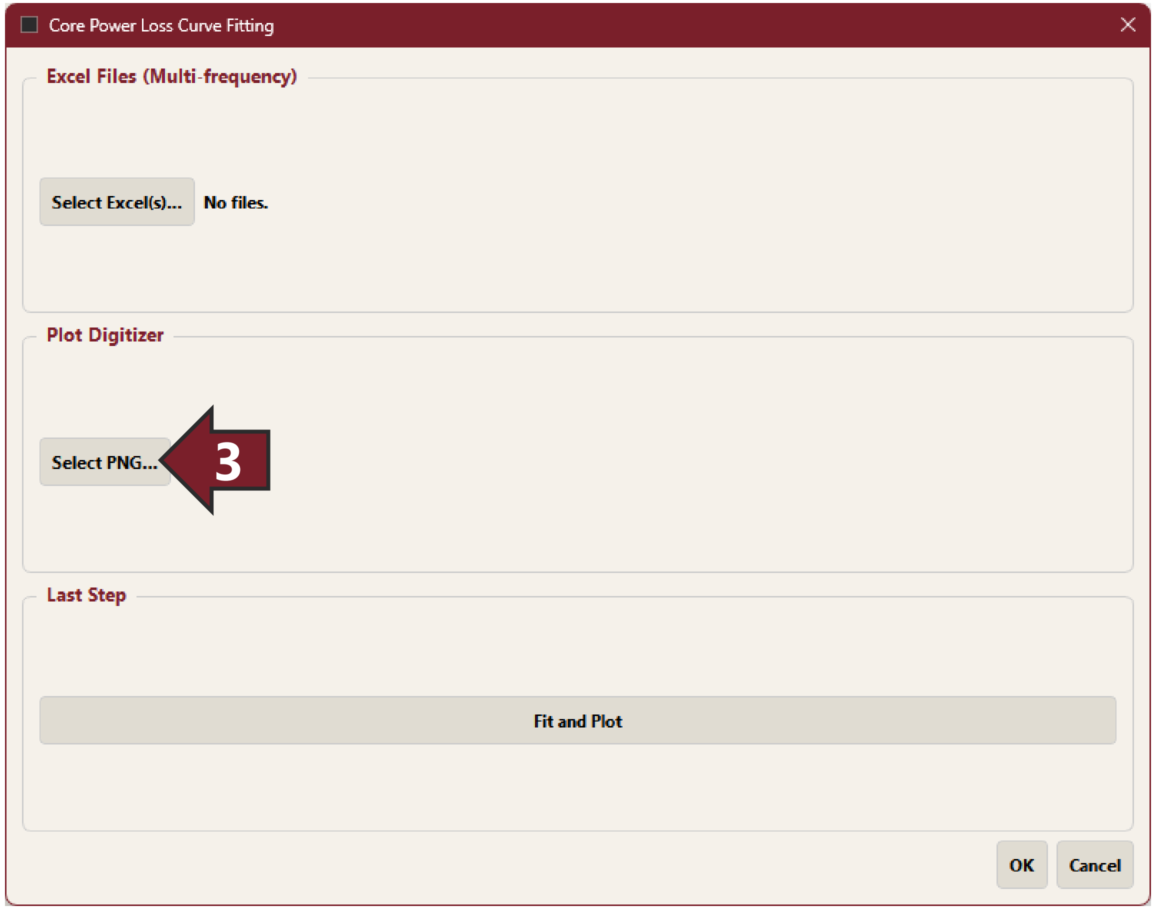




Material: **Edge_26**

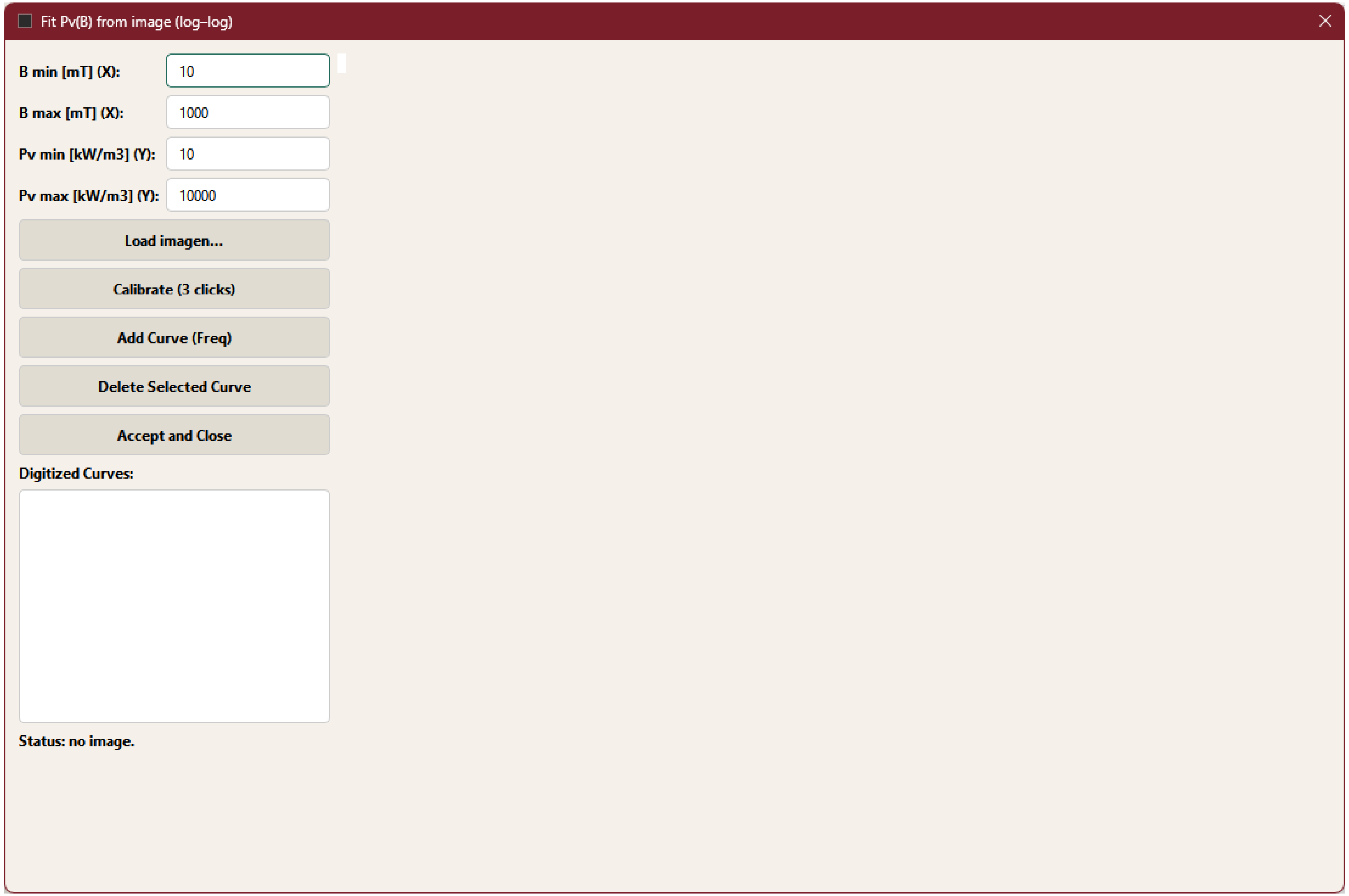
Core Material Power Losses (I)





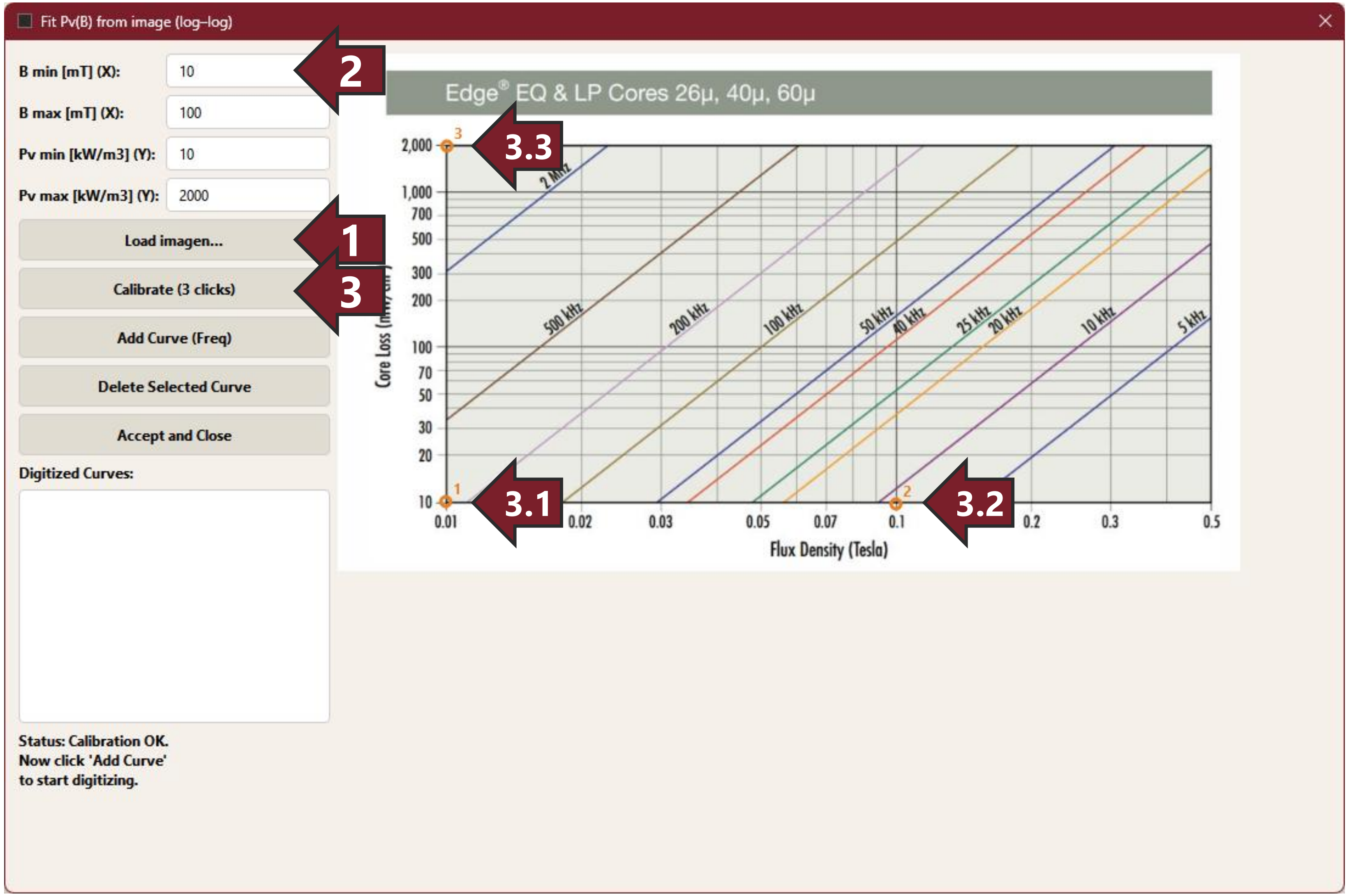
This is already characterized, but lets see how would we do it manually.

1. Power loss tab
2. Add Pv Curve
3. Plot Digitalizer – Select PNG



DIGITALIZE PLOTS

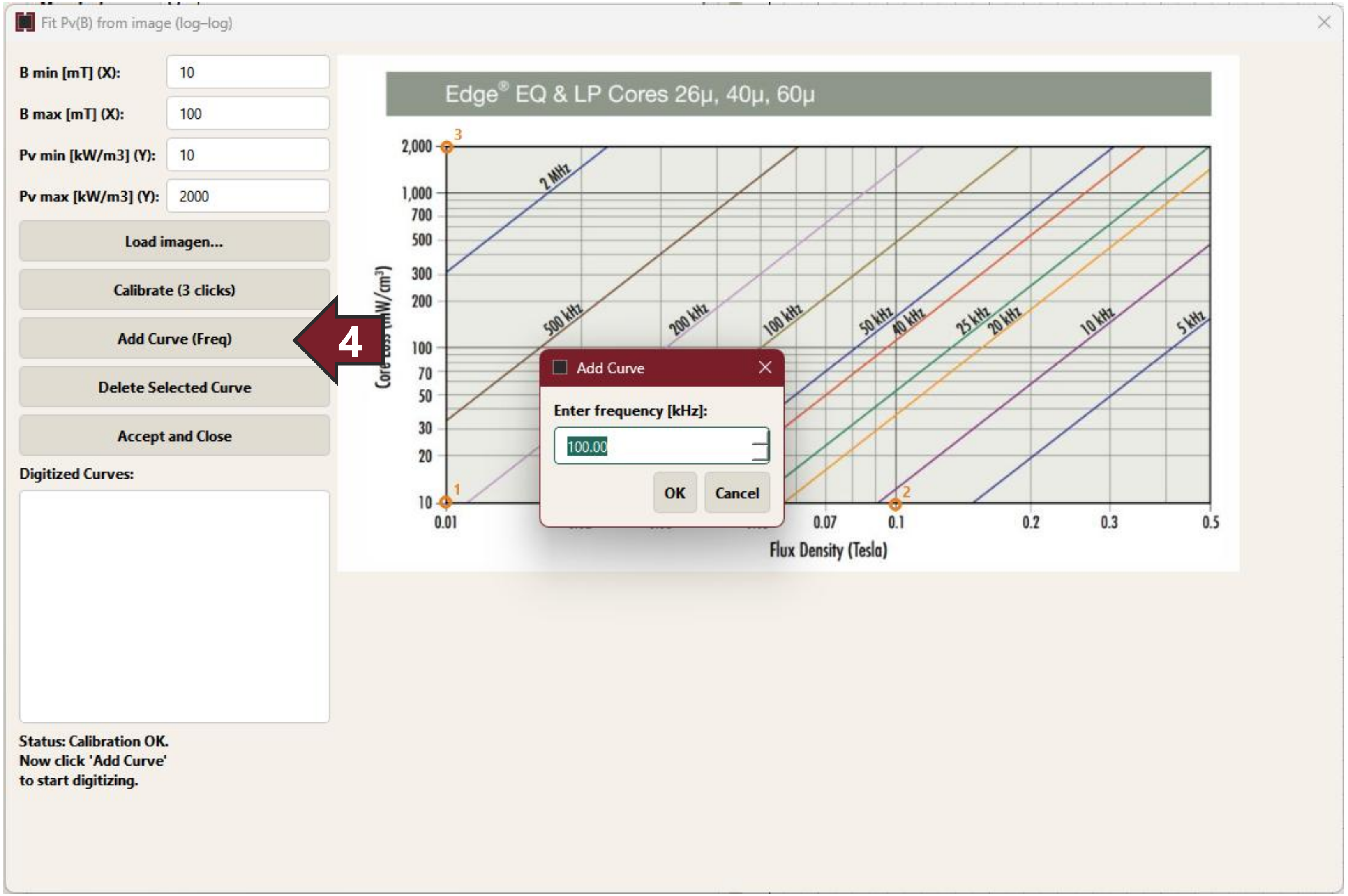
Core Material Power Losses (III)



DIGITALIZE PLOTS

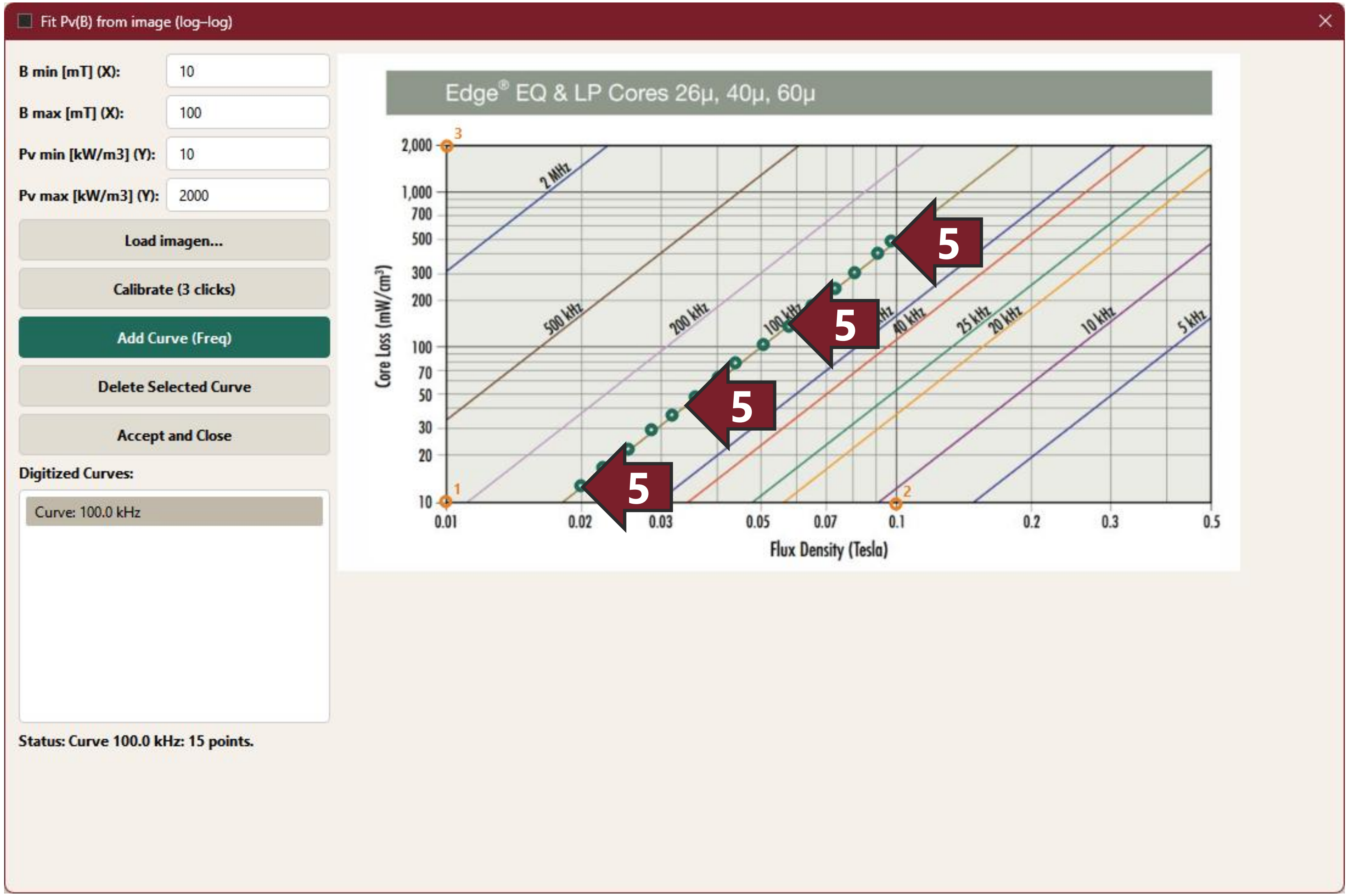
1. Load image
2. Introduce graph limits
3. Calibrate

Core Material Power Losses (IV)



DIGITALIZE PLOTS

1. Load image
2. Introduce graph limits
3. Calibrate
4. Add curve



DIGITALIZE PLOTS

❶ Load image

❷ Introduce graph limits

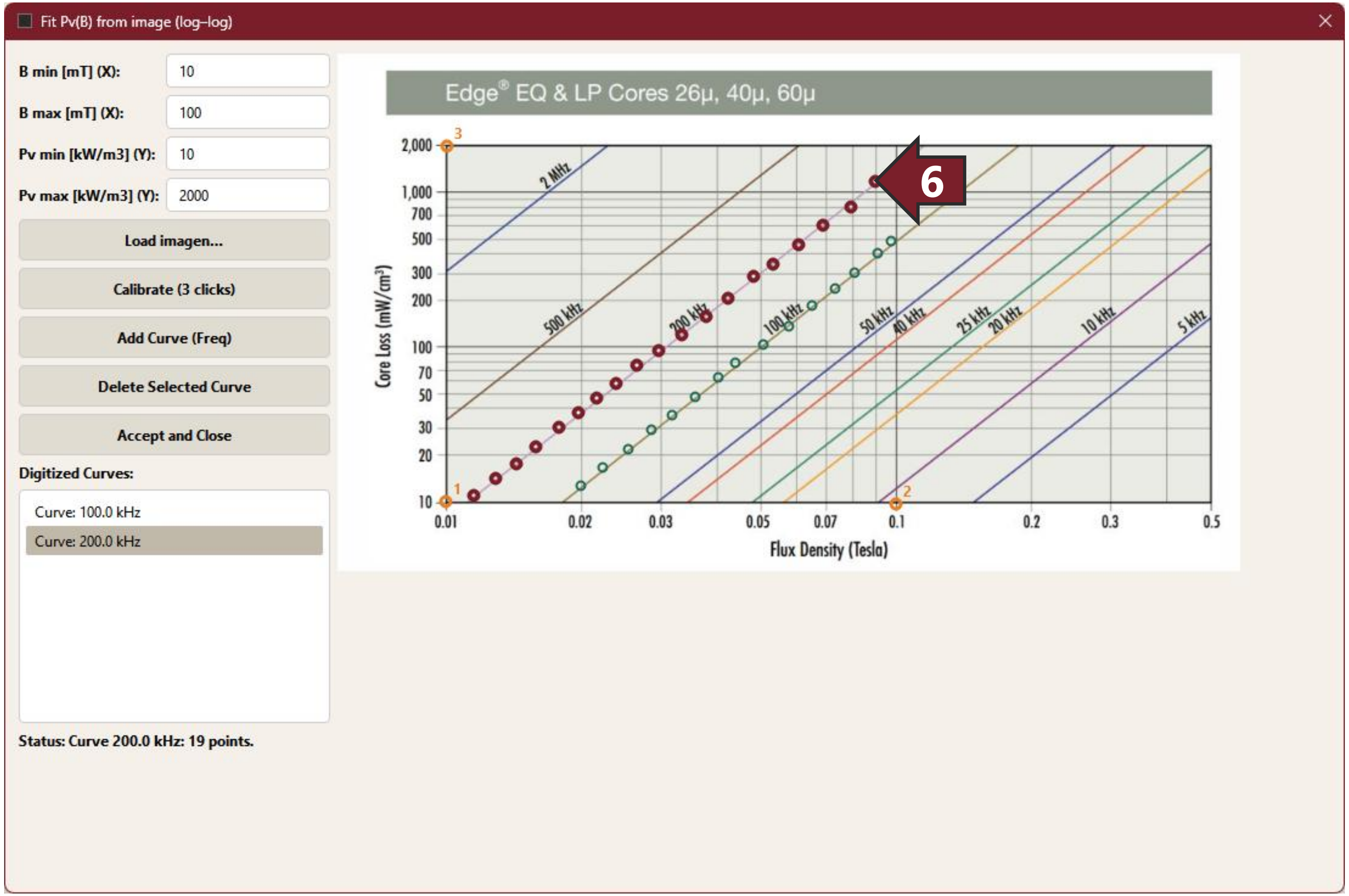
❸ Calibrate

❹ Add curve

❺ Click along the curve

Design Configuration

Core Material Power Losses (VI)

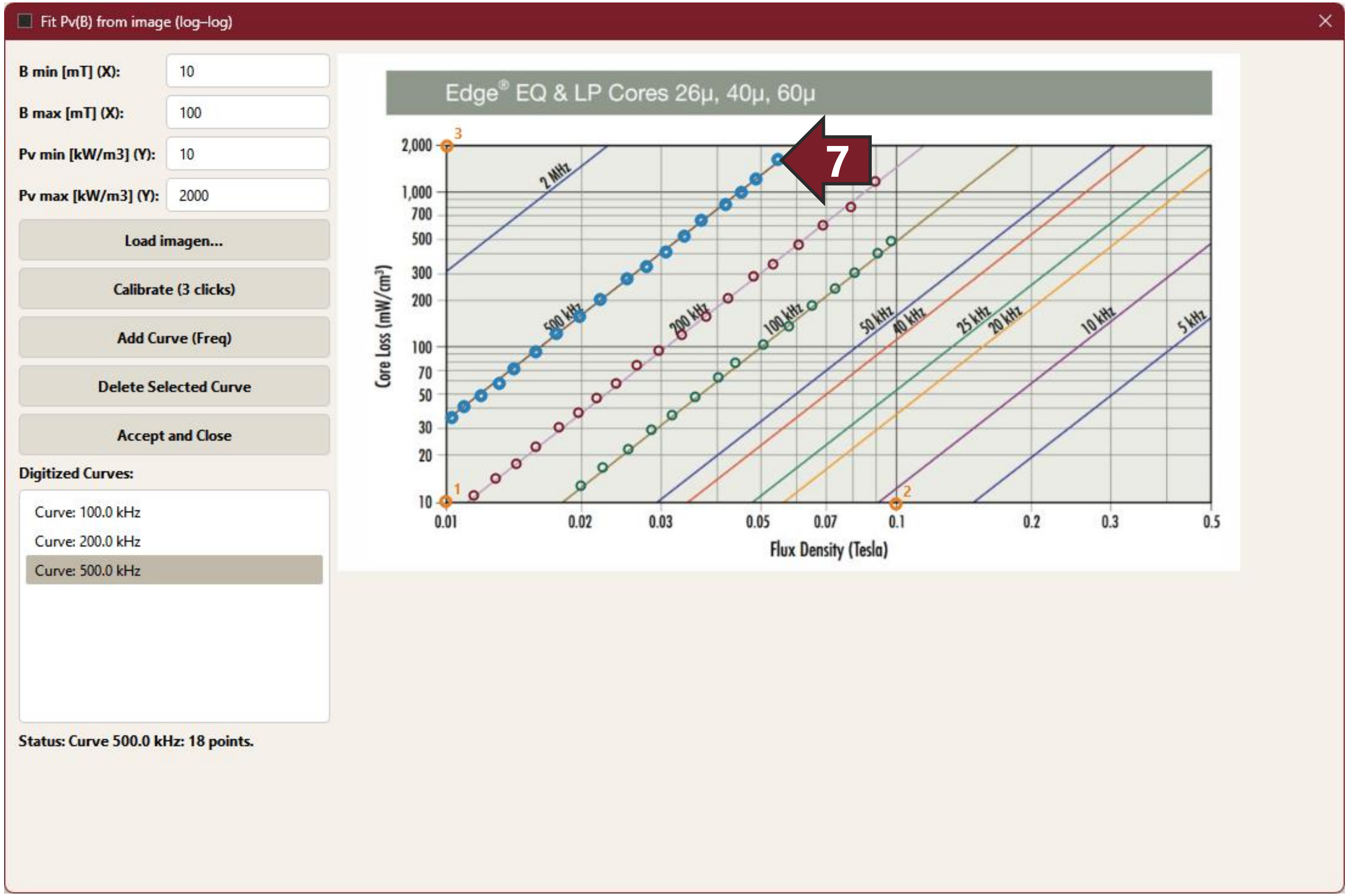


DIGITALIZE PLOTS

1. Load image
2. Introduce graph limits
3. Calibrate
4. Add curve
5. Click along the curve
6. Add more curves

Design Configuration

Core Material Power Losses (VII)



DIGITALIZE PLOTS

❶ Load image

❷ Introduce graph limits

❸ Calibrate

❹ Add curve

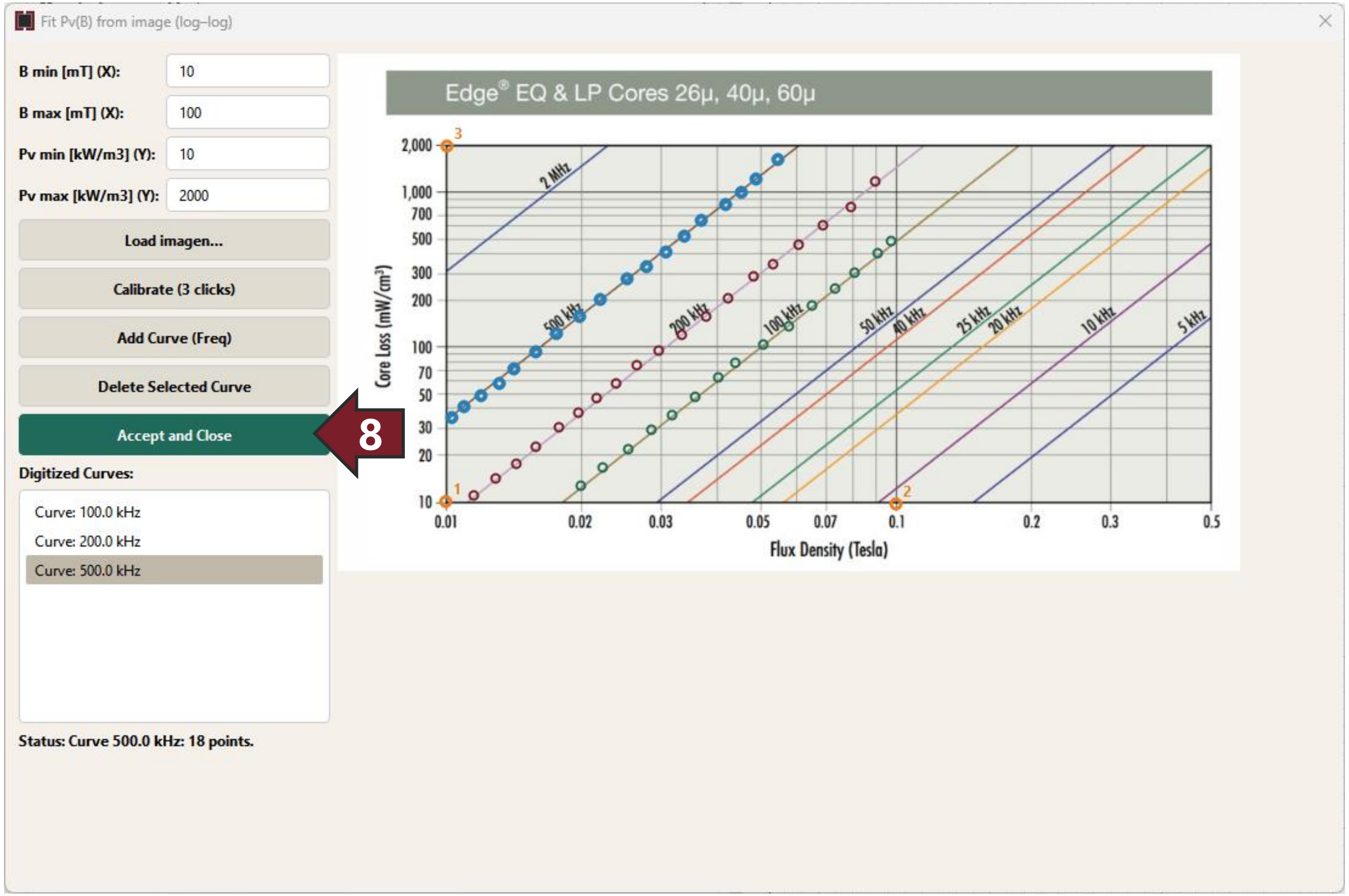
❺ Click along the curve

❻ Add more curves

❼ And more curves!

Design Configuration

Core Material Power Losses (VIII)

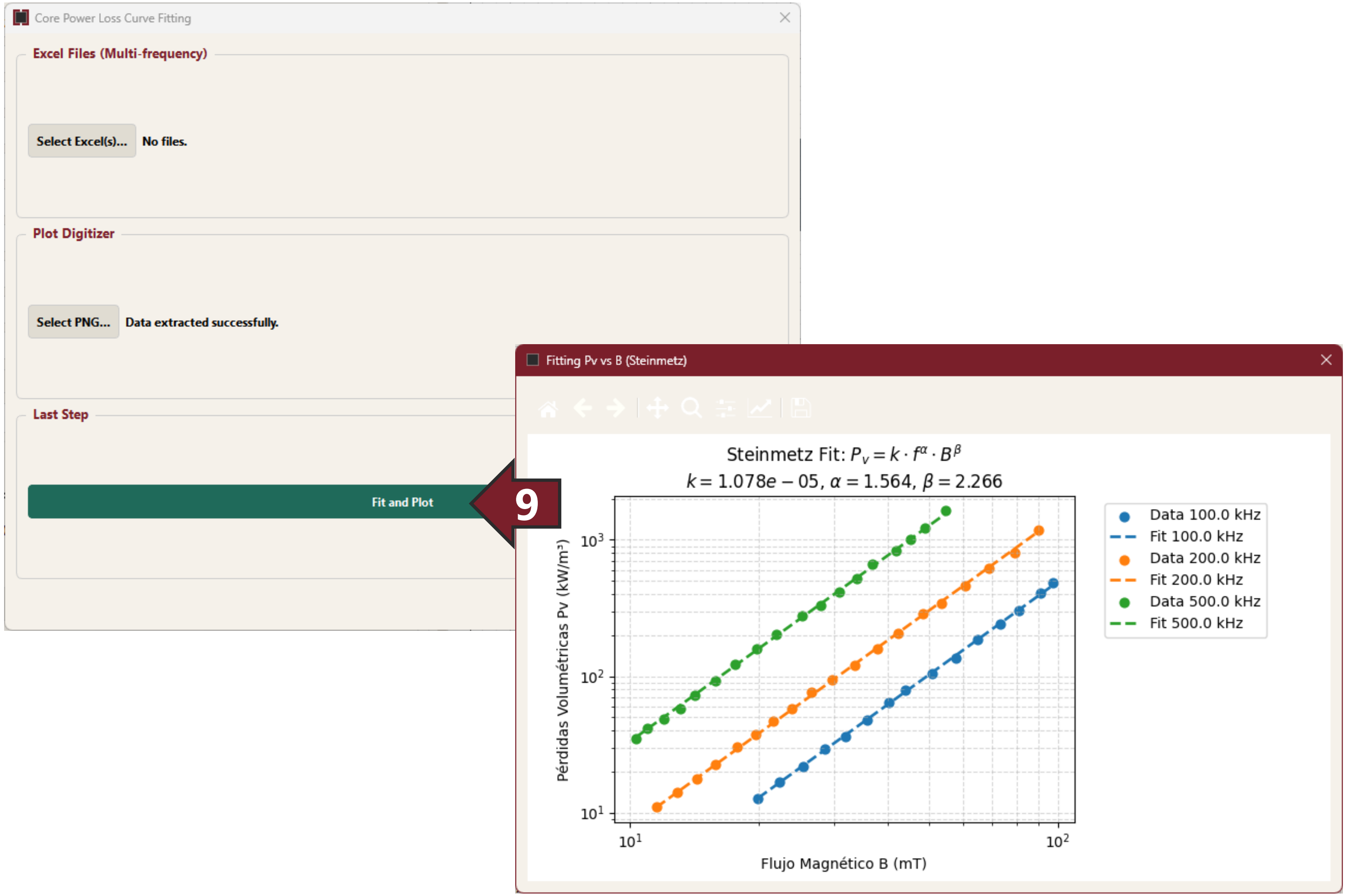


DIGITALIZE PLOTS

1. Load image
2. Introduce graph limits
3. Calibrate
4. Add curve
5. Click along the curve
6. Add more curves
7. And more curves!
8. Accept and close

Design Configuration

Core Material Power Losses (IX)

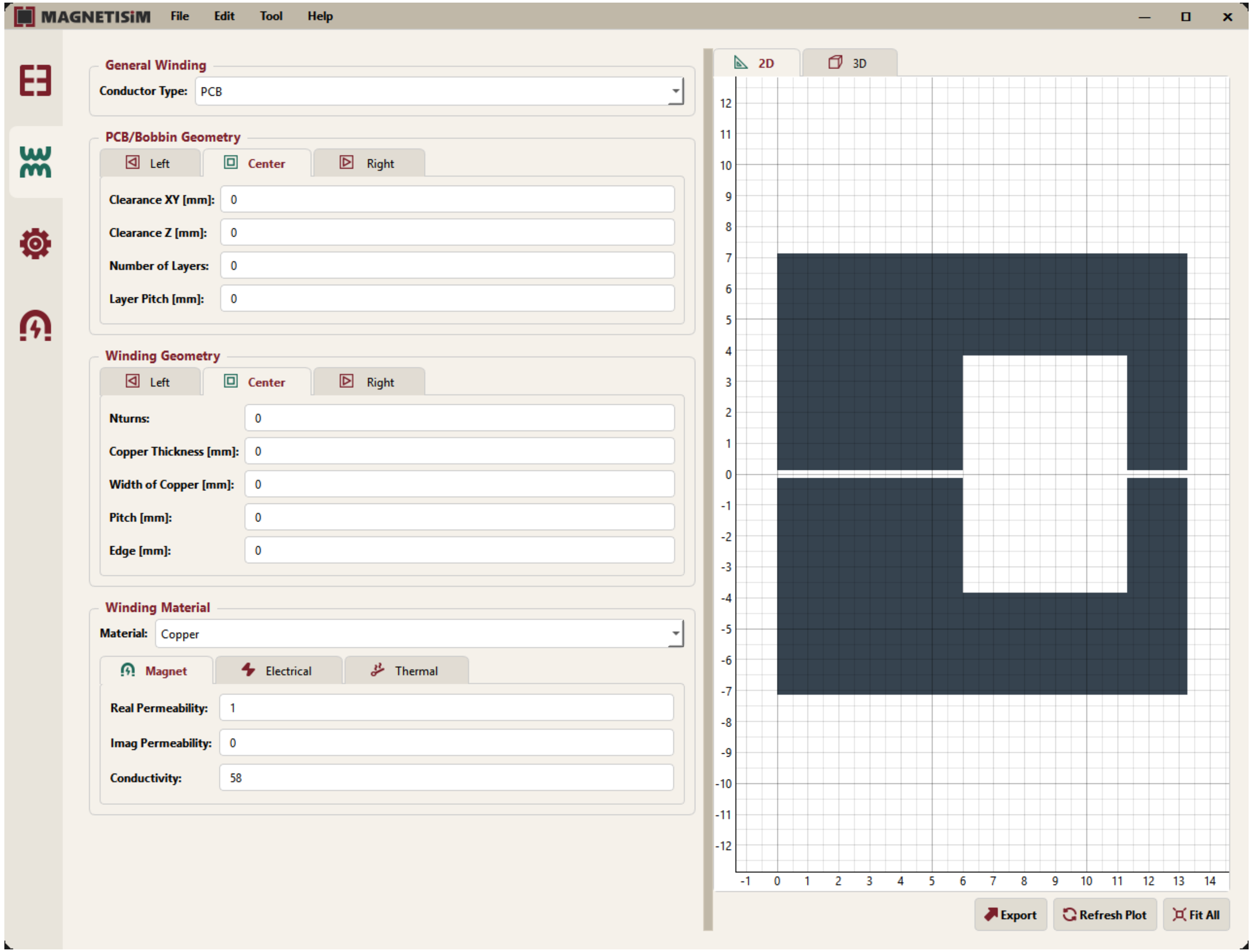


DIGITALIZE PLOTS

1. Load image
2. Introduce graph limits
3. Calibrate
4. Add curve
5. Click along the curve
6. Add more curves
7. And more curves!
8. Accept and close
9. Fit and plot

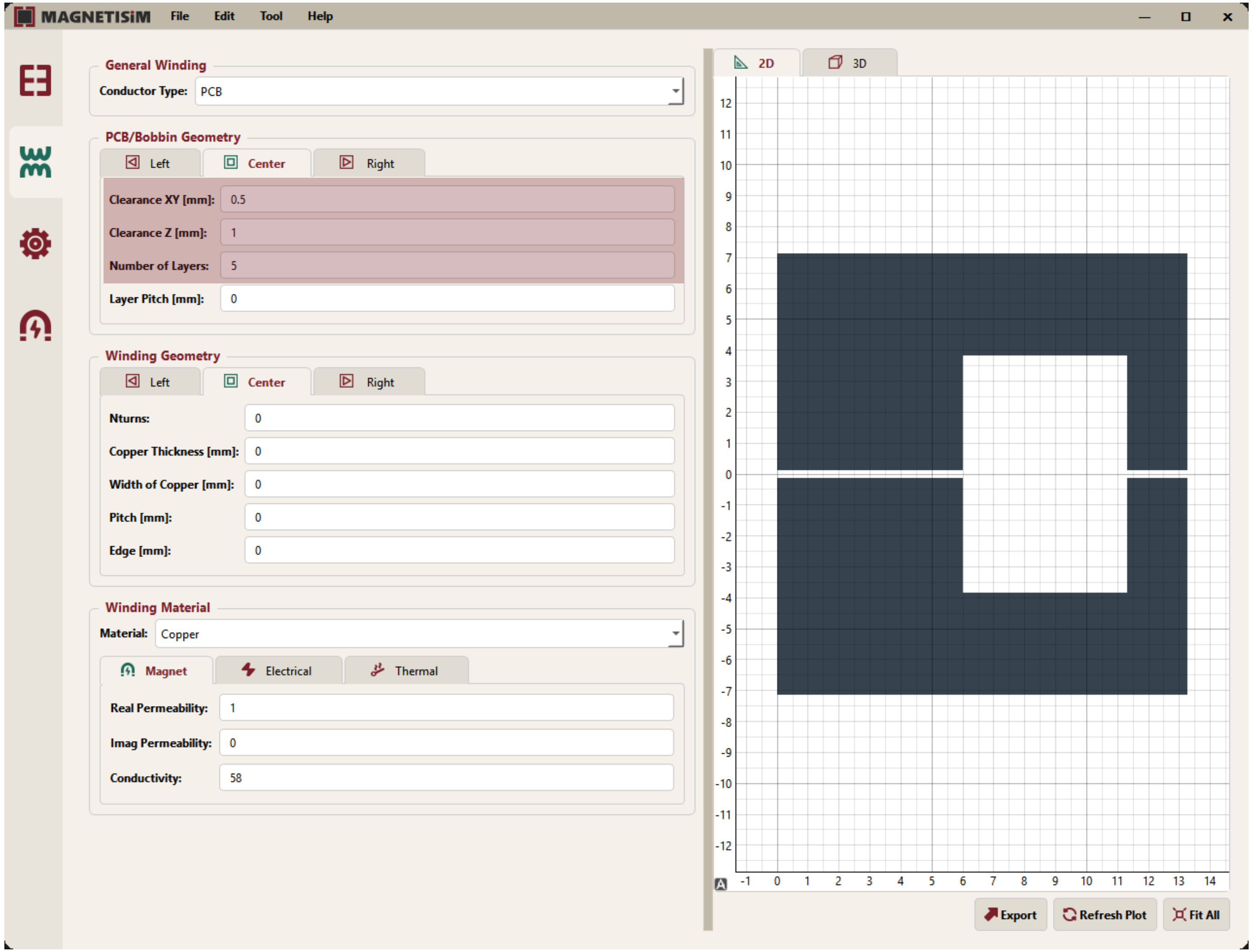
Design Configuration

Winding Geometry



Design Configuration

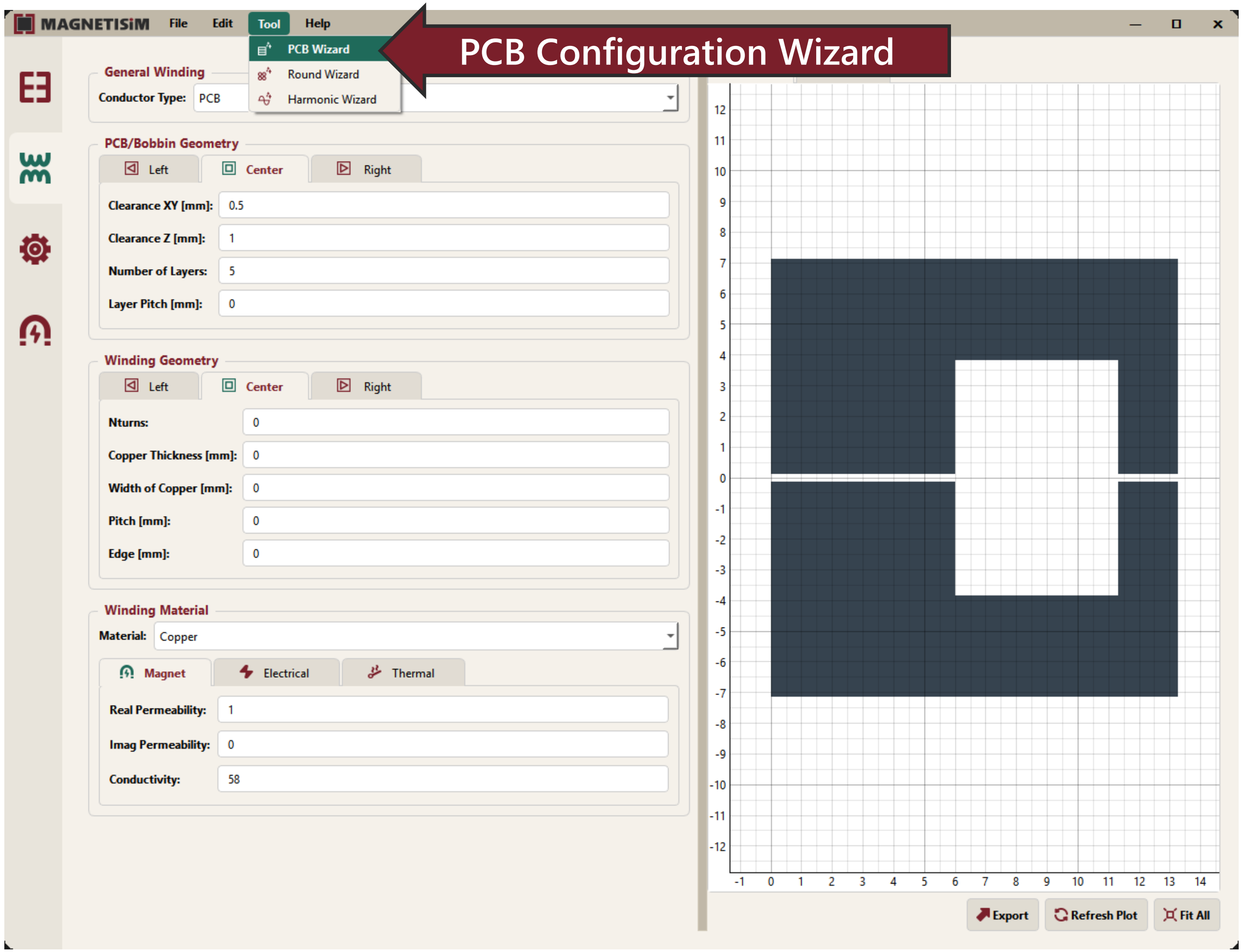
PCB/Bobbin Geometry

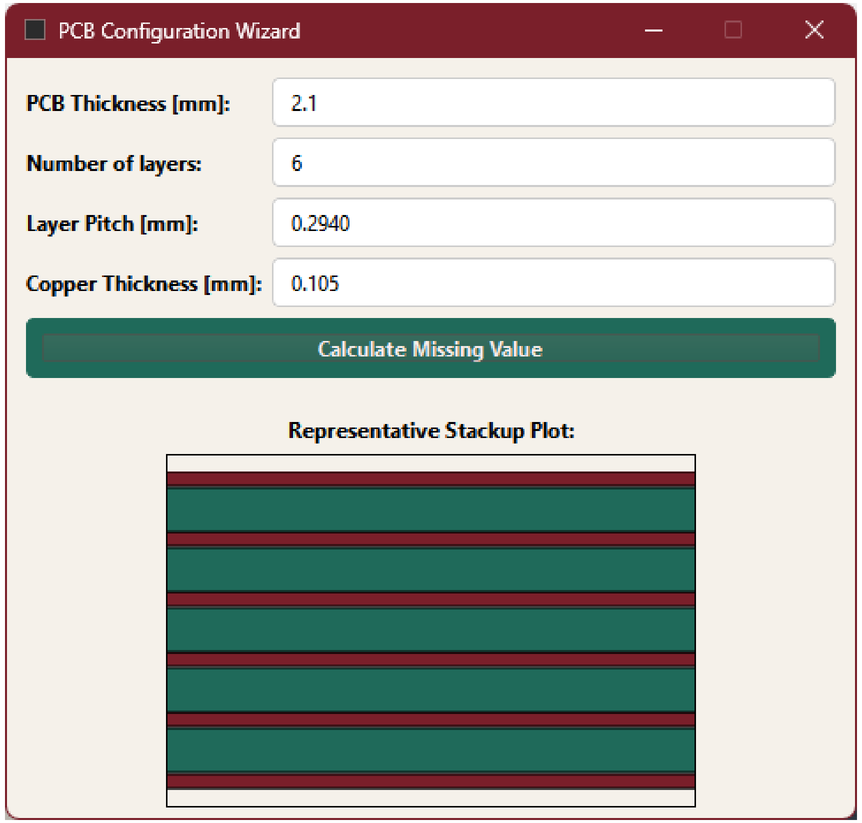


PCB/Bobbin Geometry	
Clearance XY [mm]	**0.5**
Clearance Z [mm]	**1**
Number of Layers	**5**
Layer Pitch [mm]	0

Design Configuration

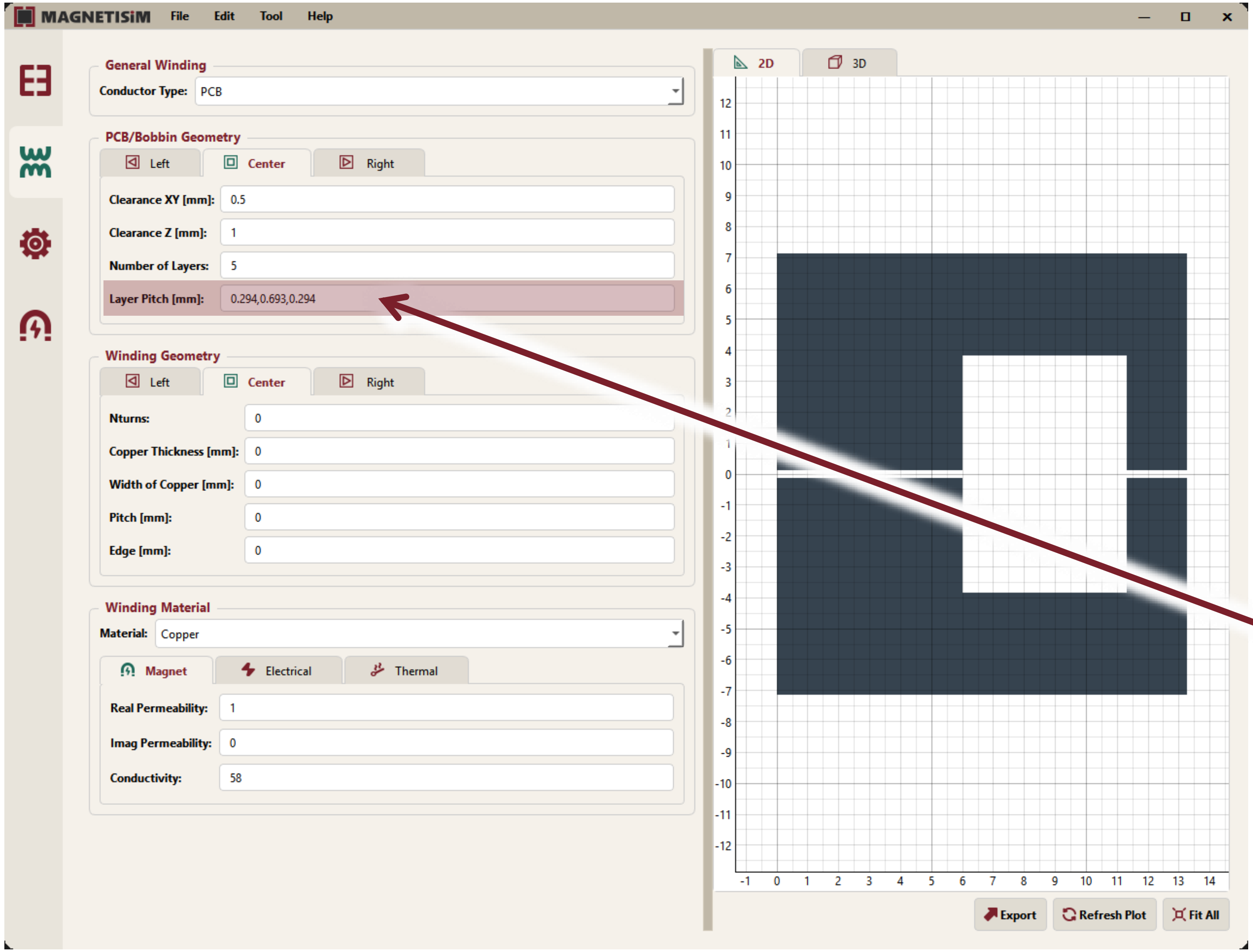
PCB Configuration Wizard





Design Configuration

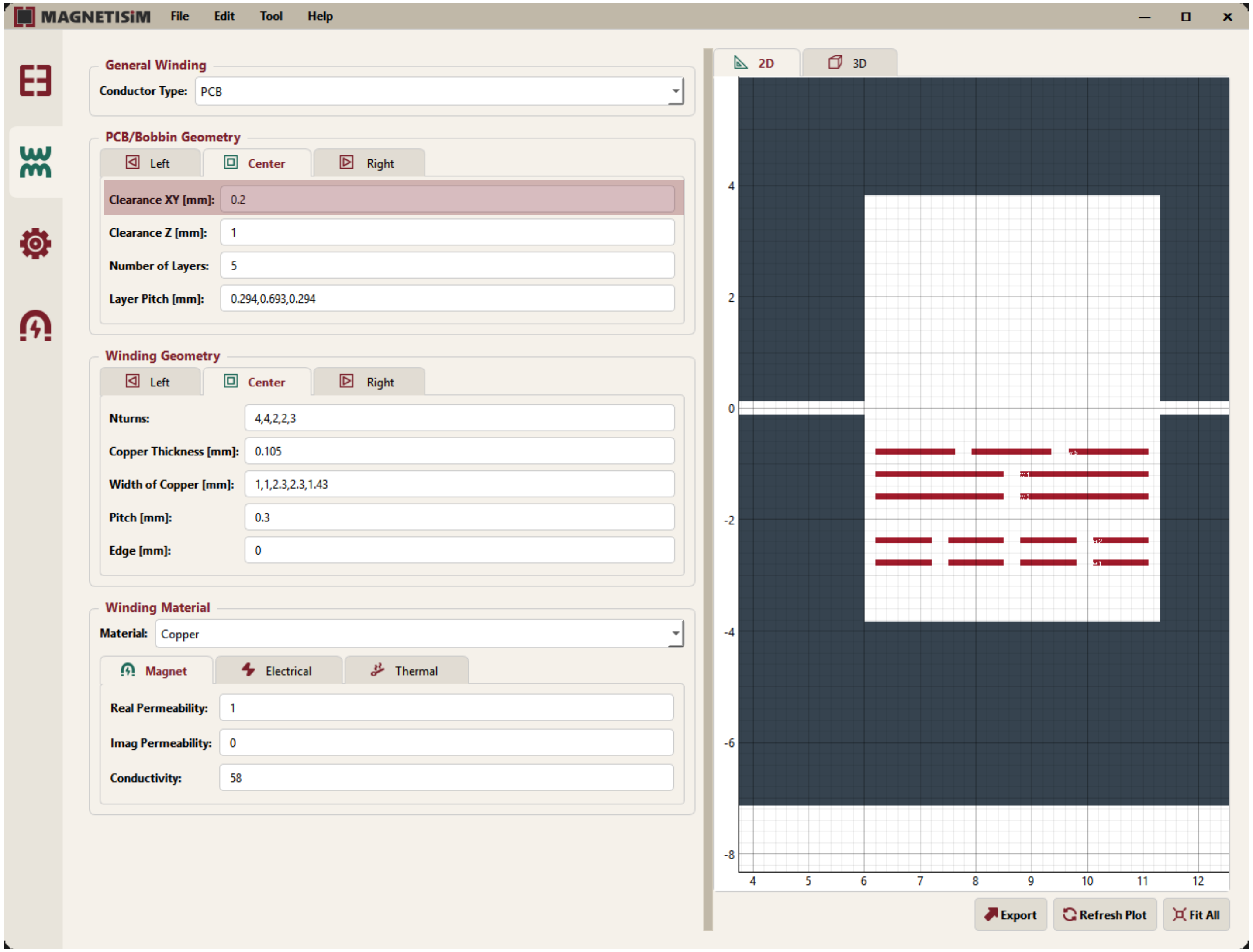
Vector Inputs



PCB/Bobbin Geometry	
Clearance XY [mm]	0.5
Clearance Z [mm]	1
Number of Layers	5
Layer Pitch [mm]	**0.294, 0.693, 0.294**

Design Configuration

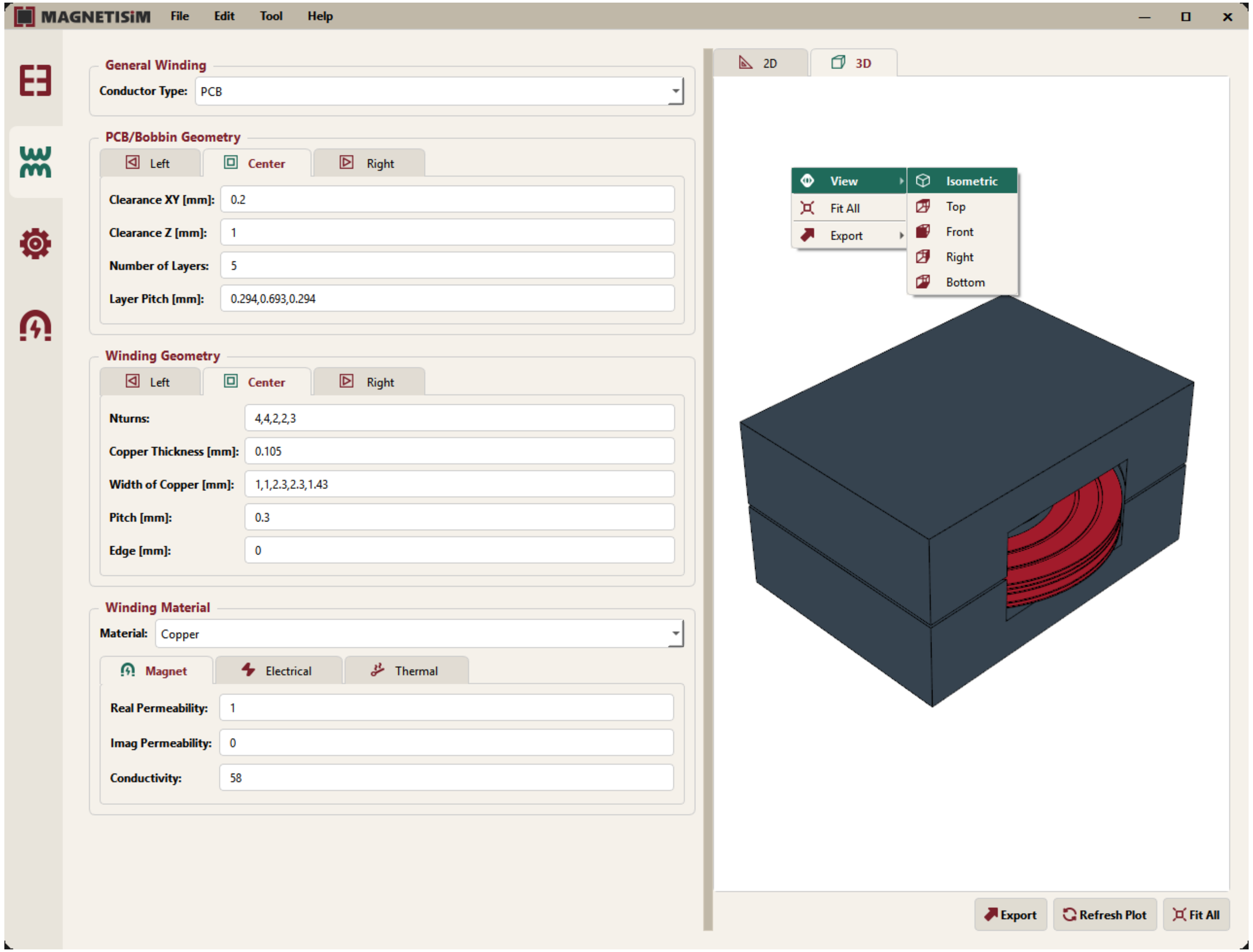
Clearance Adjustment

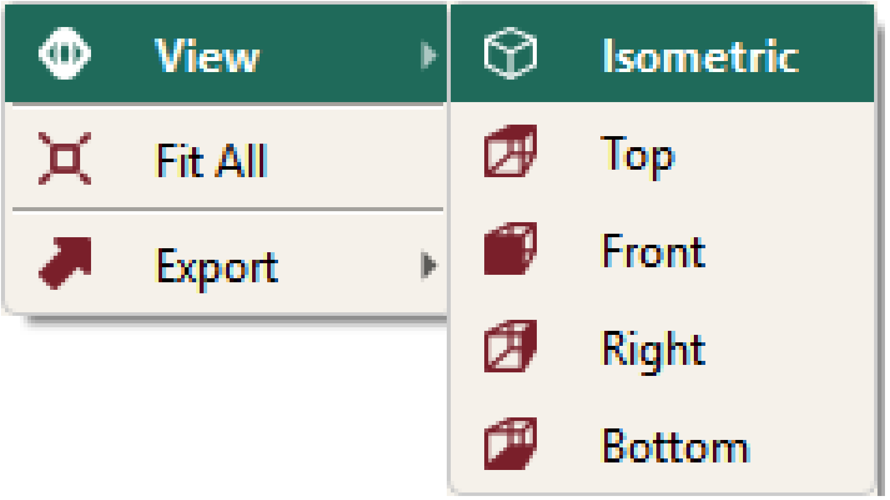


PCB/Bobbin Geometry	
Clearance XY [mm]	**0.2**
Clearance Z [mm]	1
Number of Layers	5
Layer Pitch [mm]	0.294, 0.693, 0.294

Design Configuration

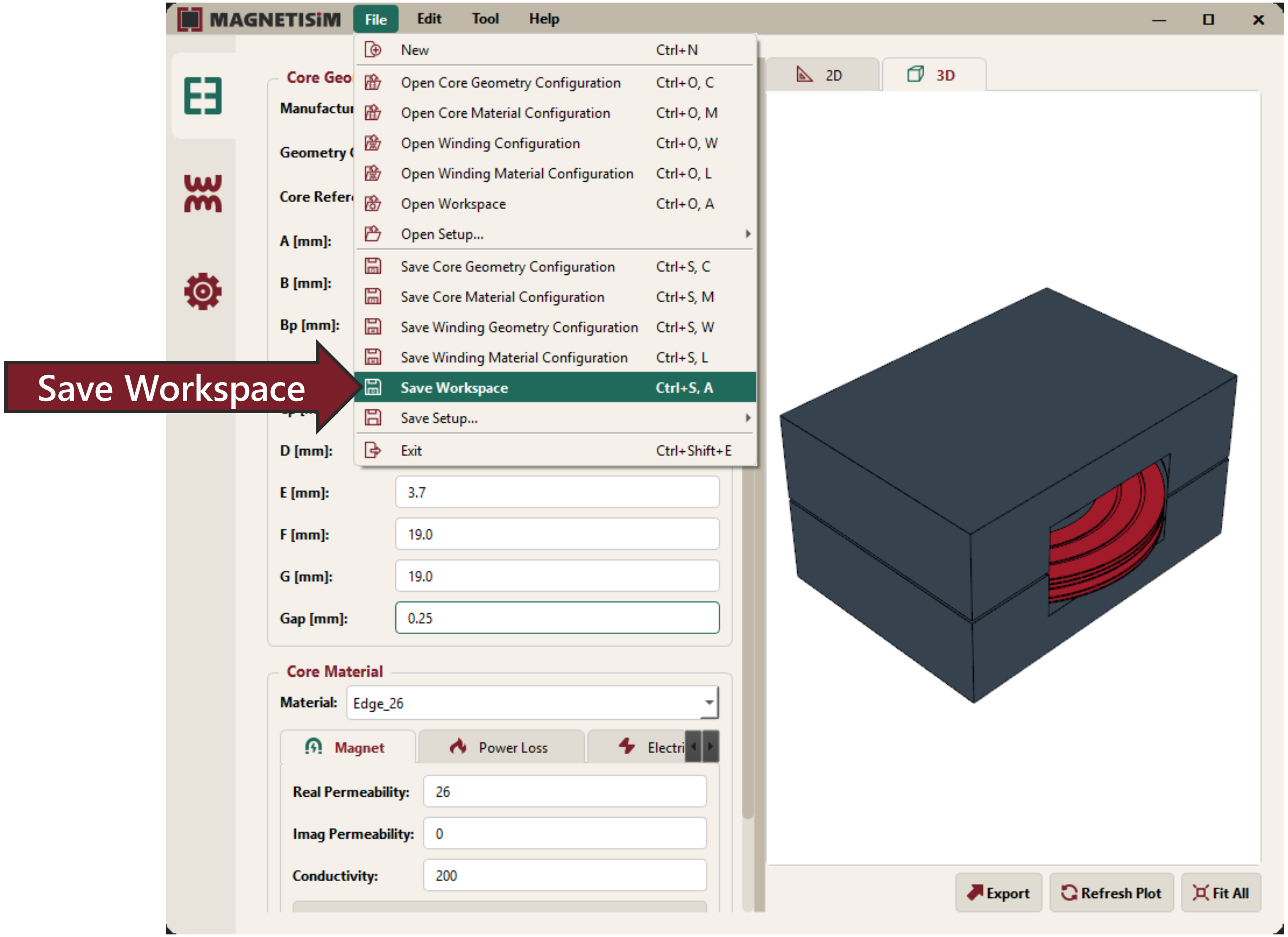
3D Viewer Options



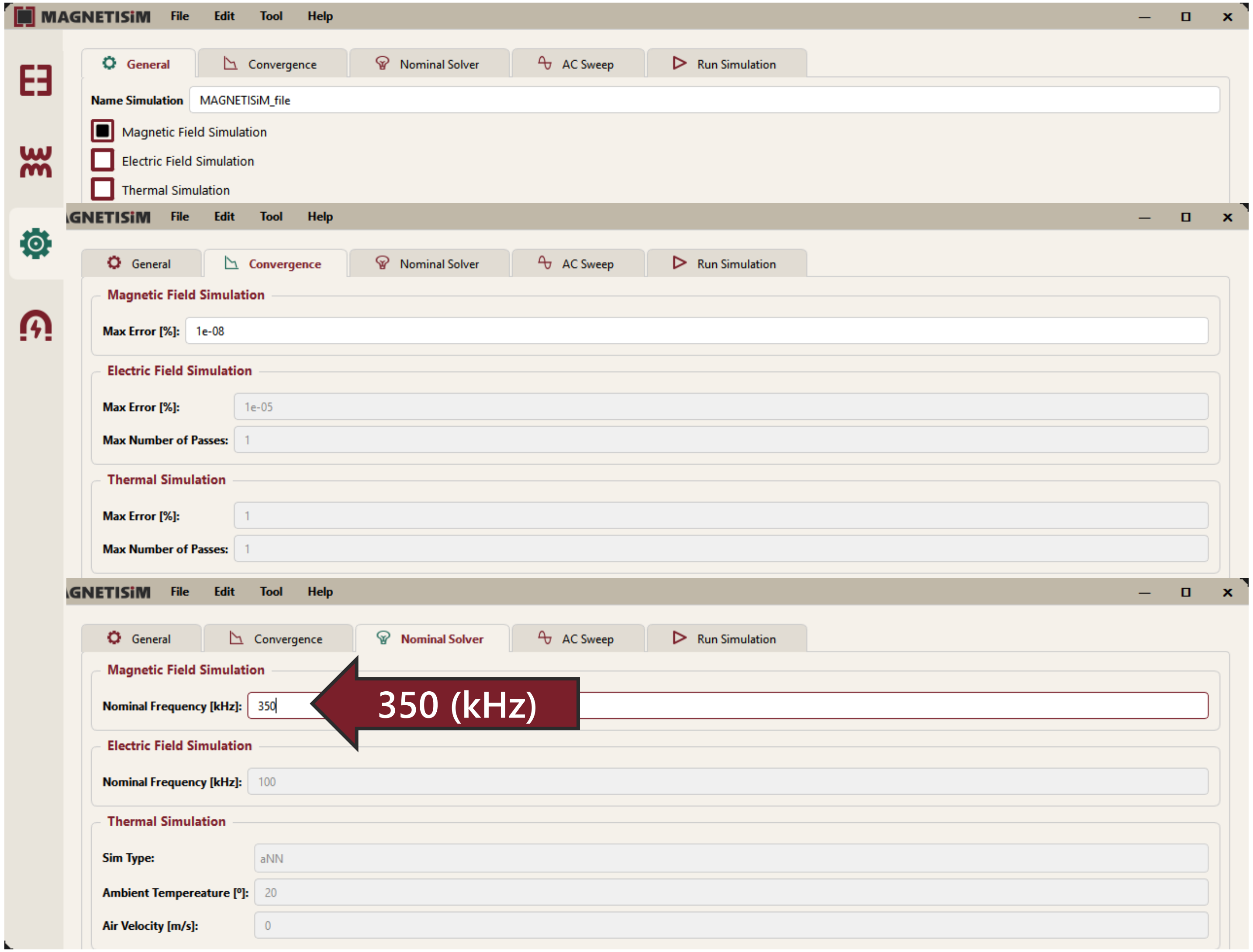


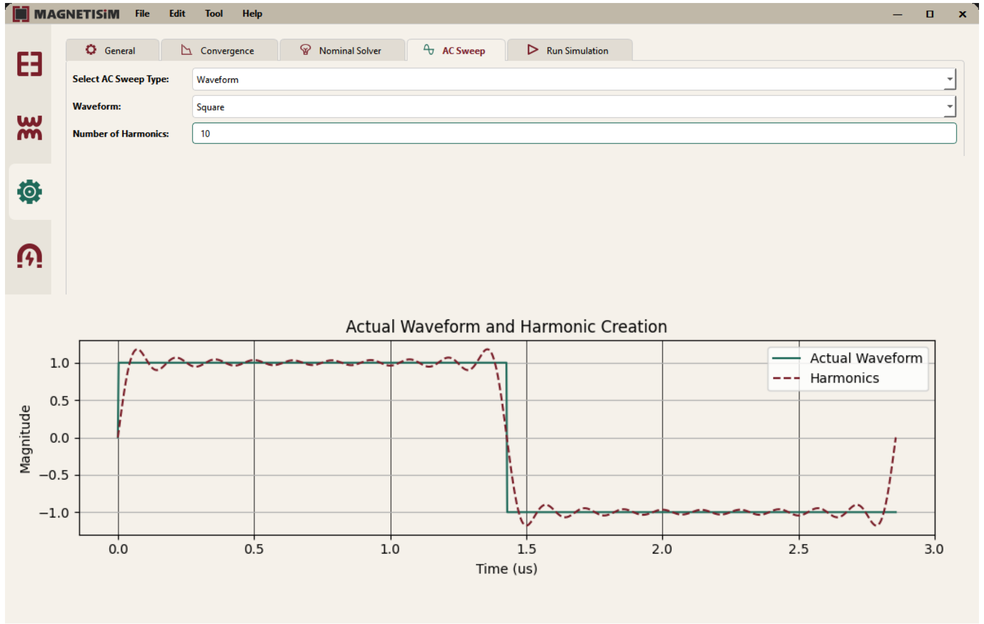
Design Configuration

Save the Design



Simulation Setup

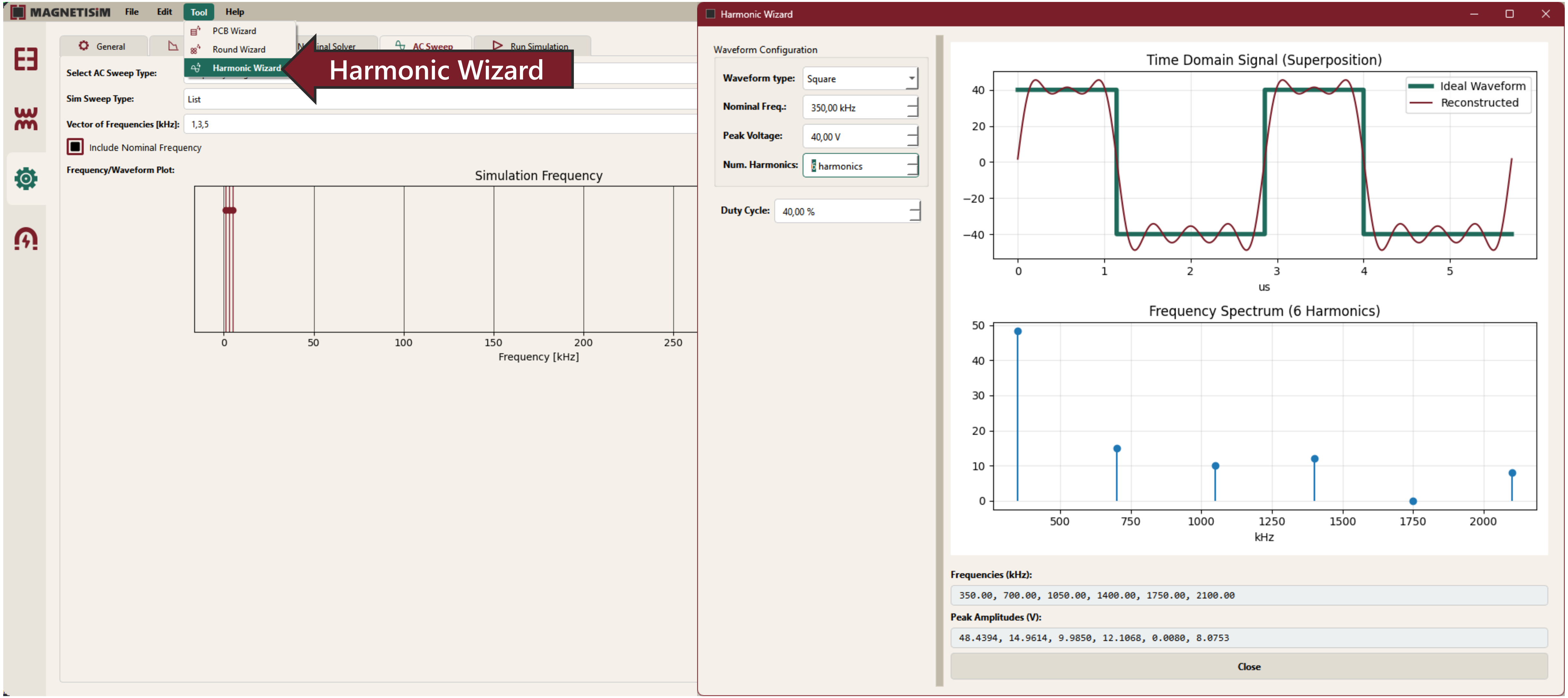




AC Sweep	
Select AC Sweep Type	Waveform
Waveform	Square
Number of Harmonics	10

Simulation Setup

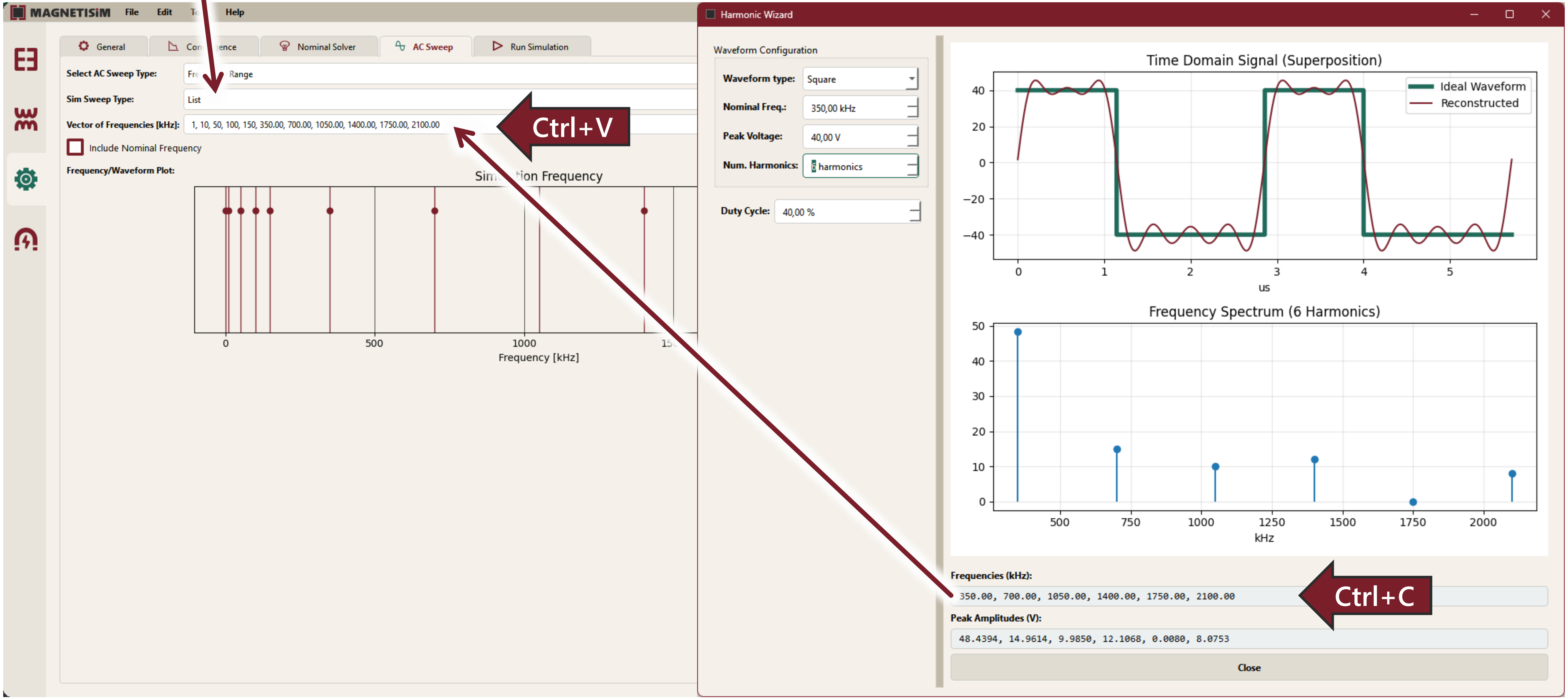
Harmonic Wizard (I)



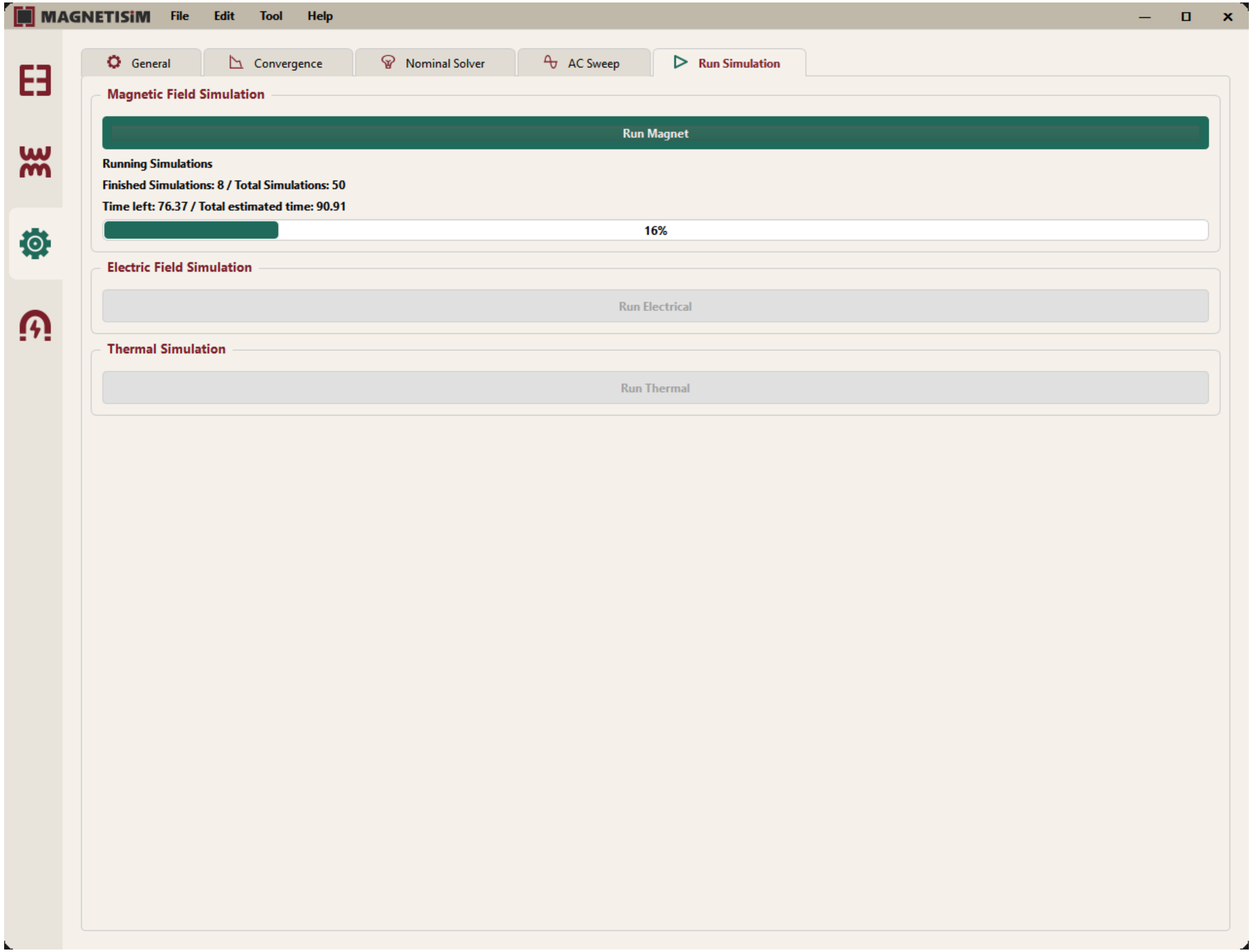
Simulation Setup

Harmonic Wizard (II)

Also add: 1,10,100,150

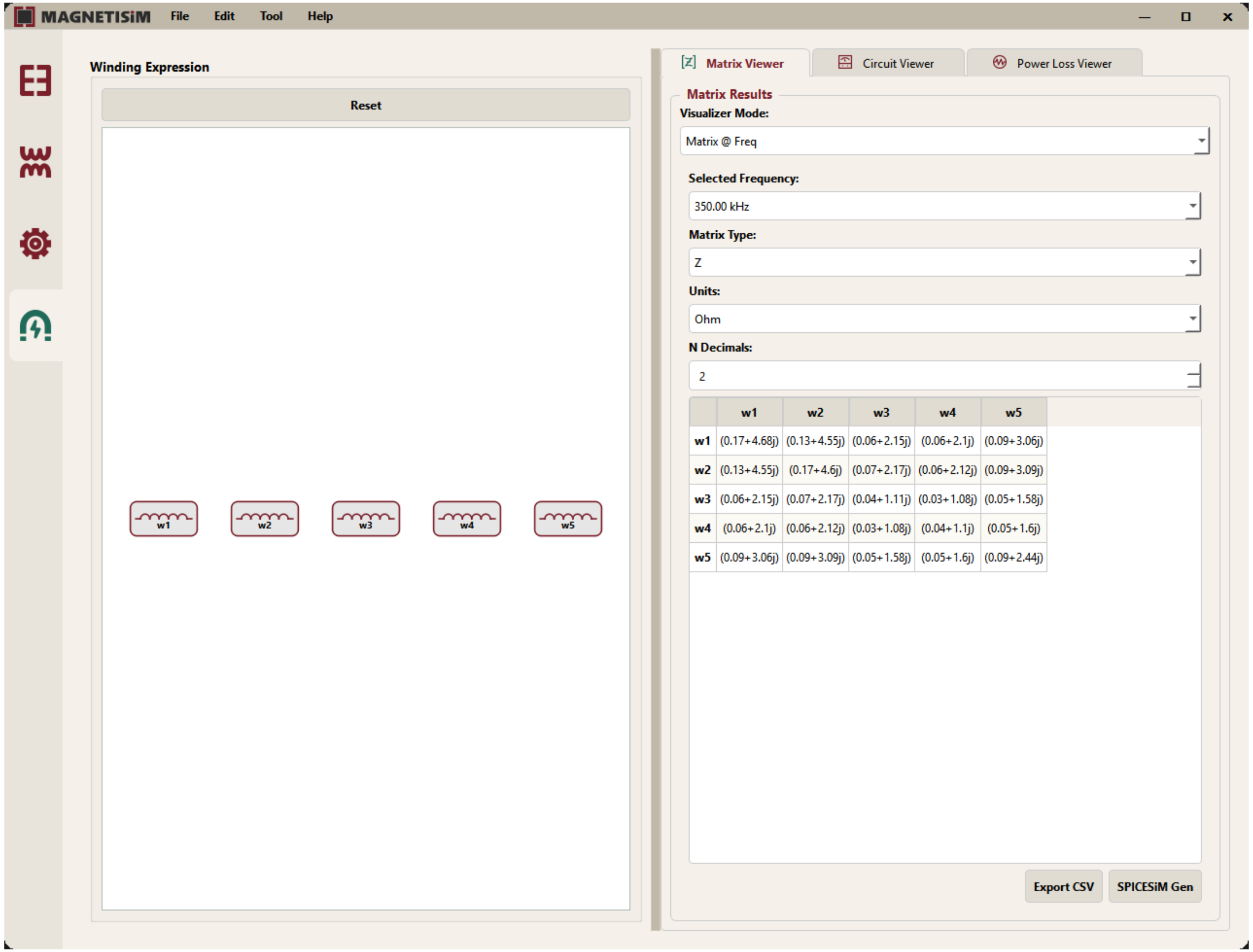


Run Magnet Simulation



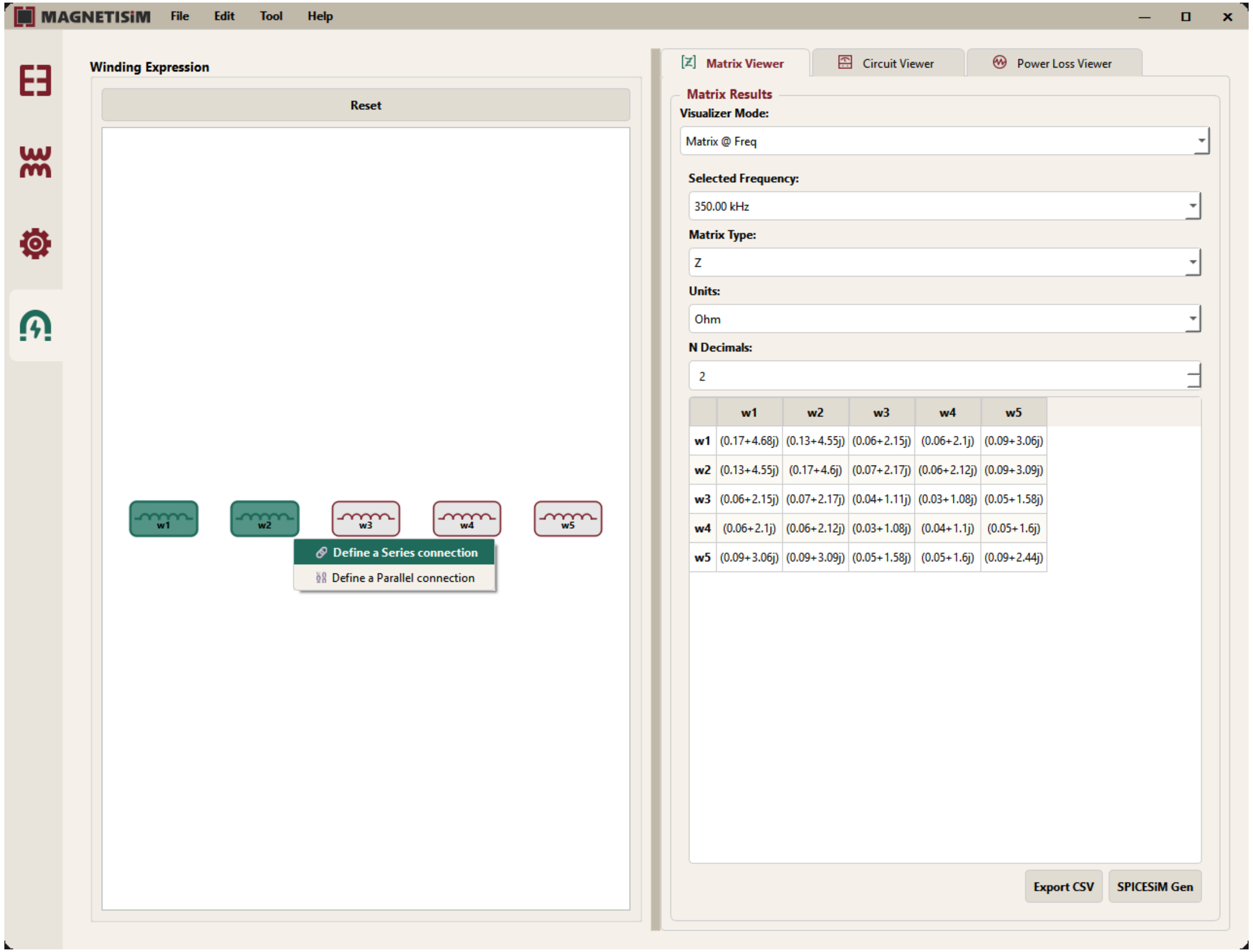
Results Postprocessing

Matrix Viewer



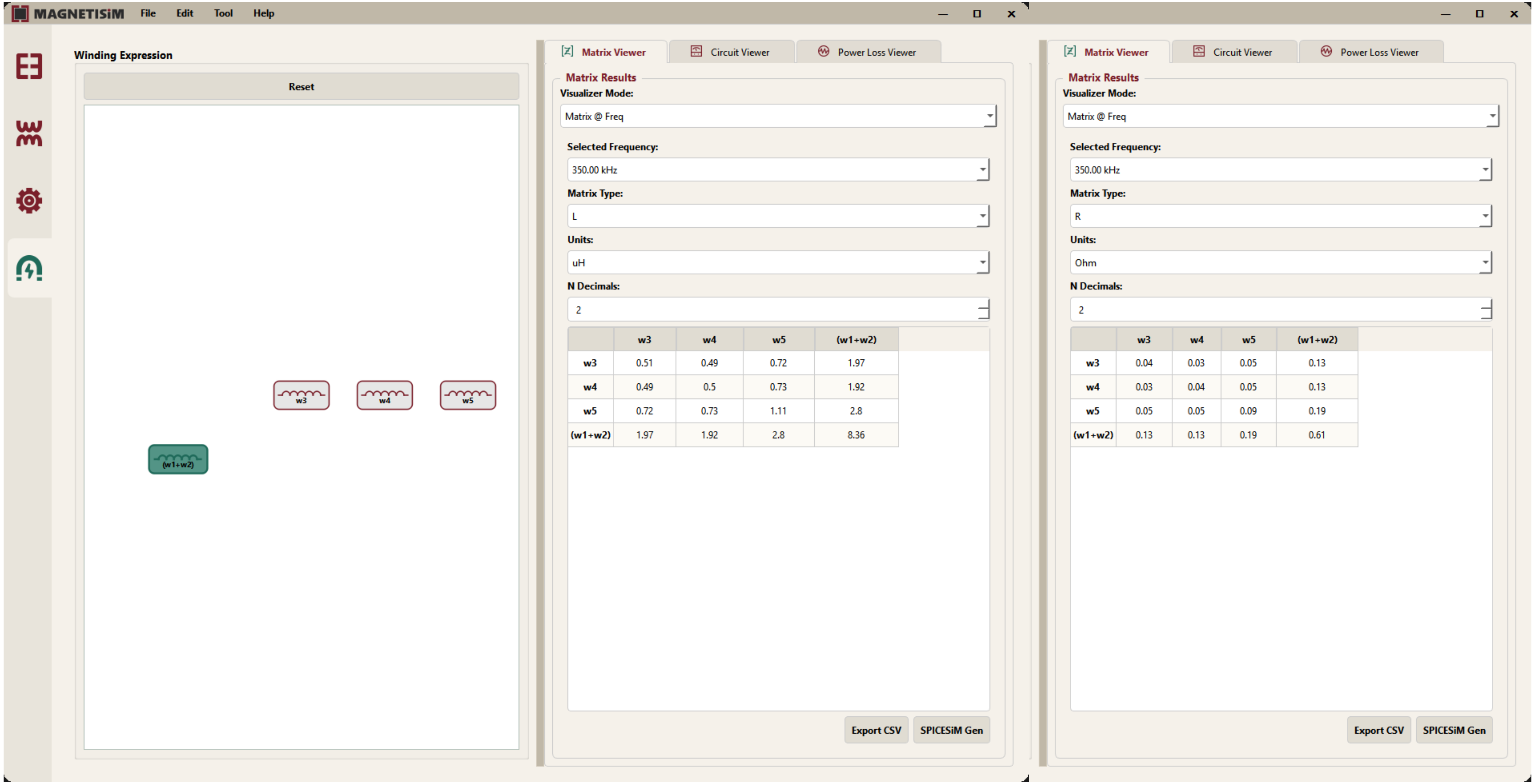
Results Postprocessing

Winding Connections



Results Postprocessing

Matrix View @ Frequency

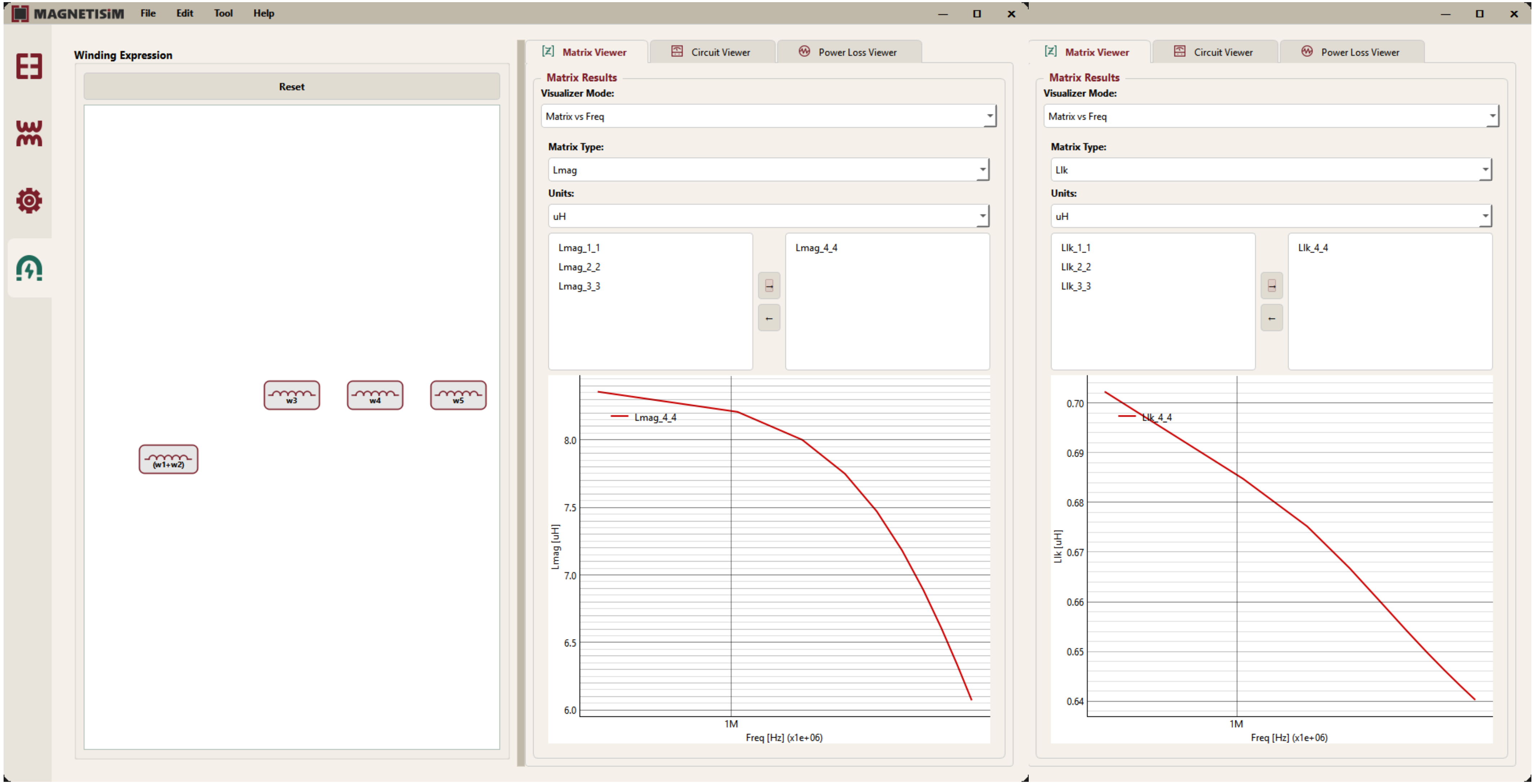


	w3	w4	w5	(w1+w2)
w3	0.51	0.49	0.72	1.97
w4	0.49	0.5	0.73	1.92
w5	0.72	0.73	1.11	2.8
(w1+w2)	1.97	1.92	2.8	8.36

	w3	w4	w5	(w1+w2)
w3	0.04	0.03	0.05	0.13
w4	0.03	0.04	0.05	0.13
w5	0.05	0.05	0.09	0.19
(w1+w2)	0.13	0.13	0.19	0.61

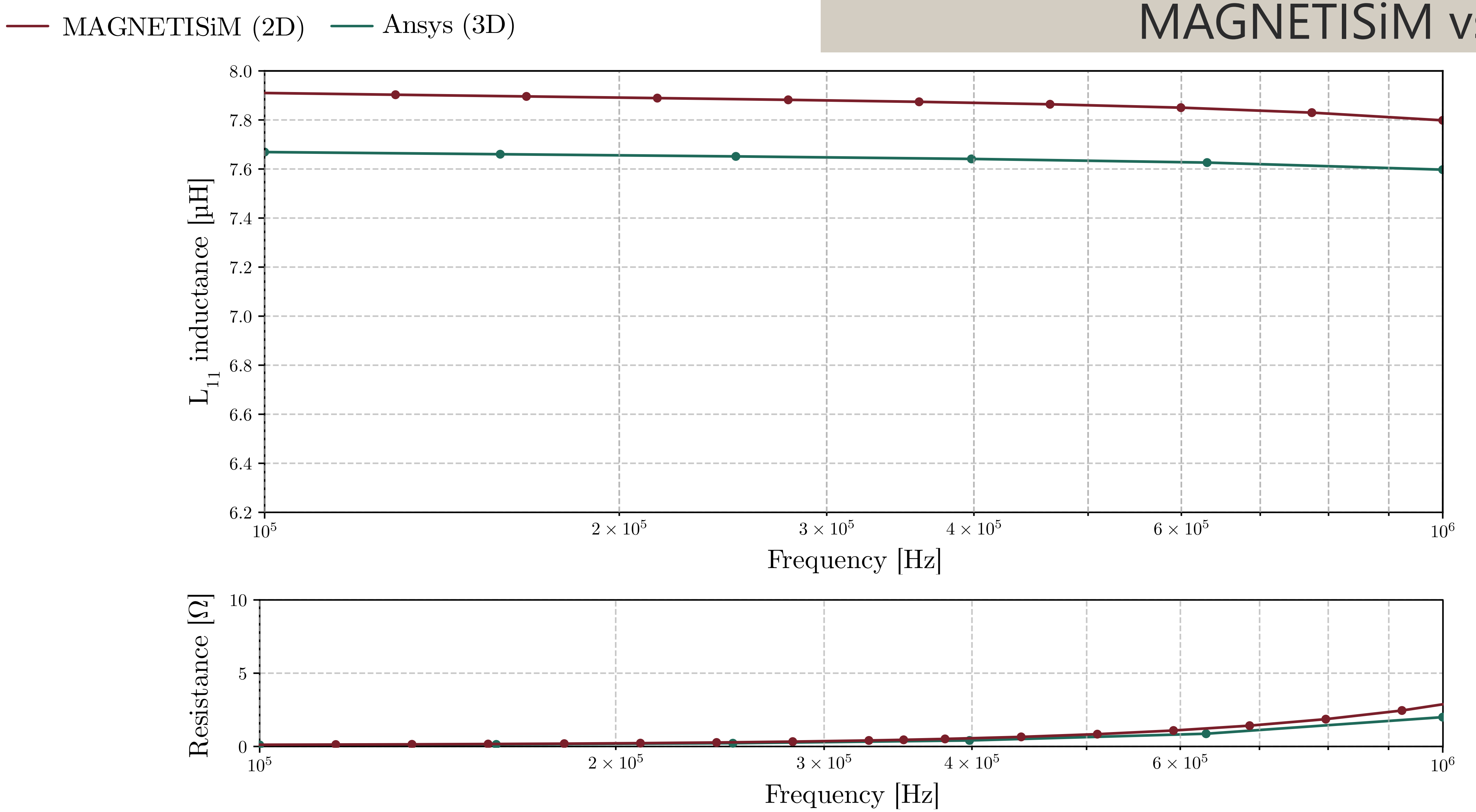
Results Postprocessing

Matrix View vs Frequency



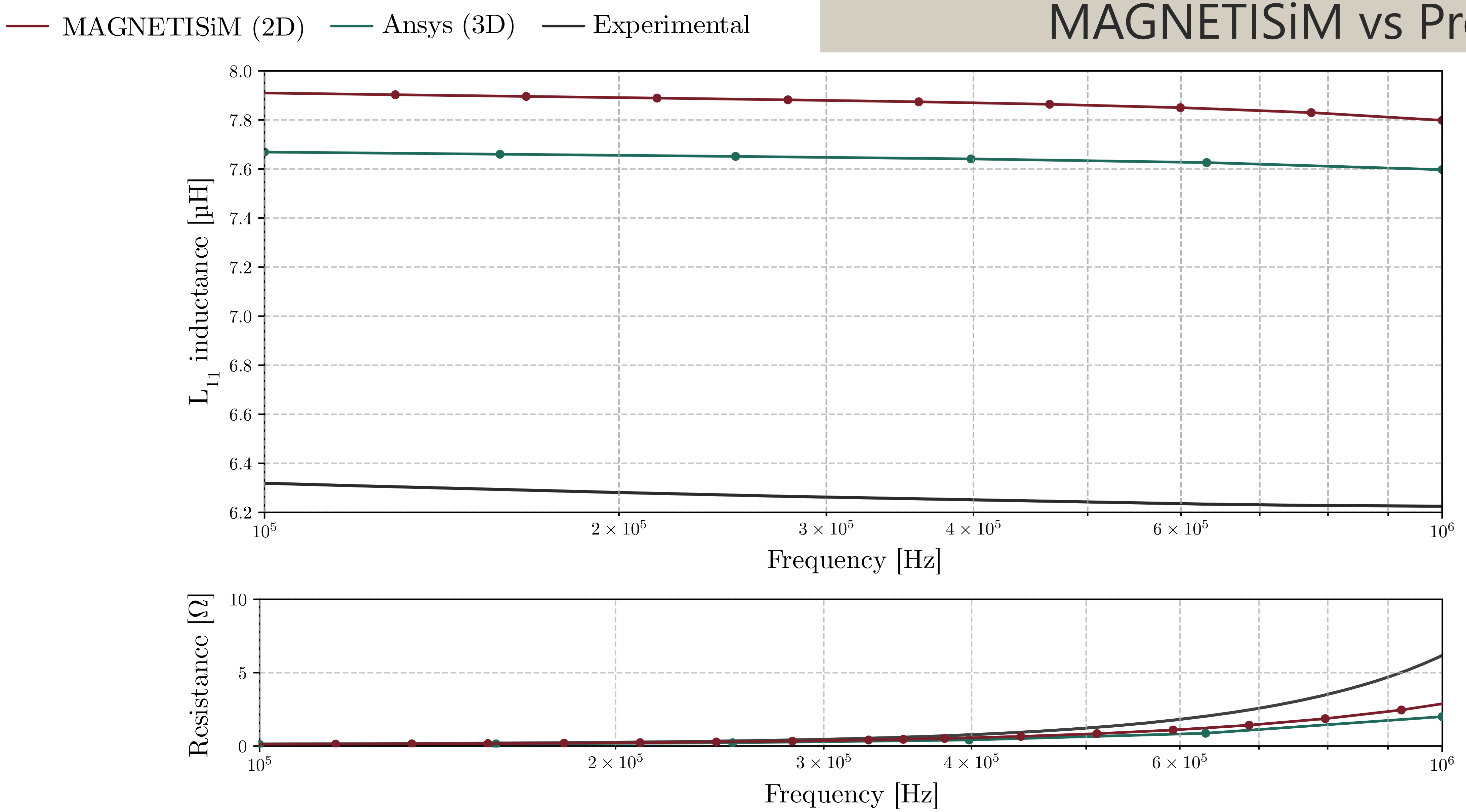
Results Postprocessing

MAGNETISiM vs Ansys



Results Postprocessing

MAGNETISiM vs Prototype

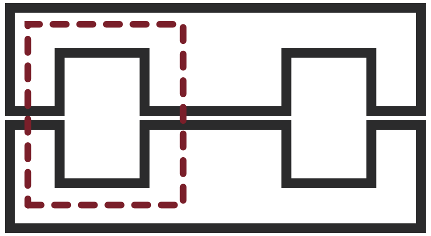


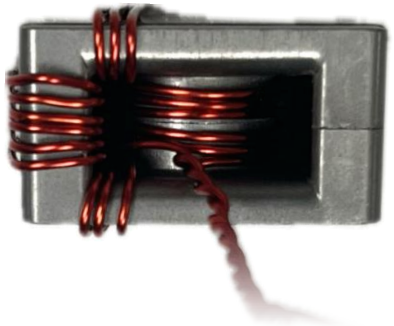
Prototype Validation

MAGNETISiM vs the World (II)

A. Ferrer López and A. Delgado Expósito, "Methodology for the Design of a Planar Transformer for an Active Clamp Flyback Converter," in *Proc. 32nd Annual Seminar on Automation, Industrial Electronics and Instrumentation (SAAEI 2025)*, Aranjuez, Spain, Jul. 2025.

PERMEABILITY MEASUREMENT





$$\mathcal{R} = \frac{l}{A \cdot \mu_0 \mu_r} \qquad L = \frac{N^2}{\mathcal{R}}$$

→ $\mu_r = 20$

- Force flux direction
- Equivalent reluctance model
- Permeability extraction

L_{11} @ $\mu_r = 26$

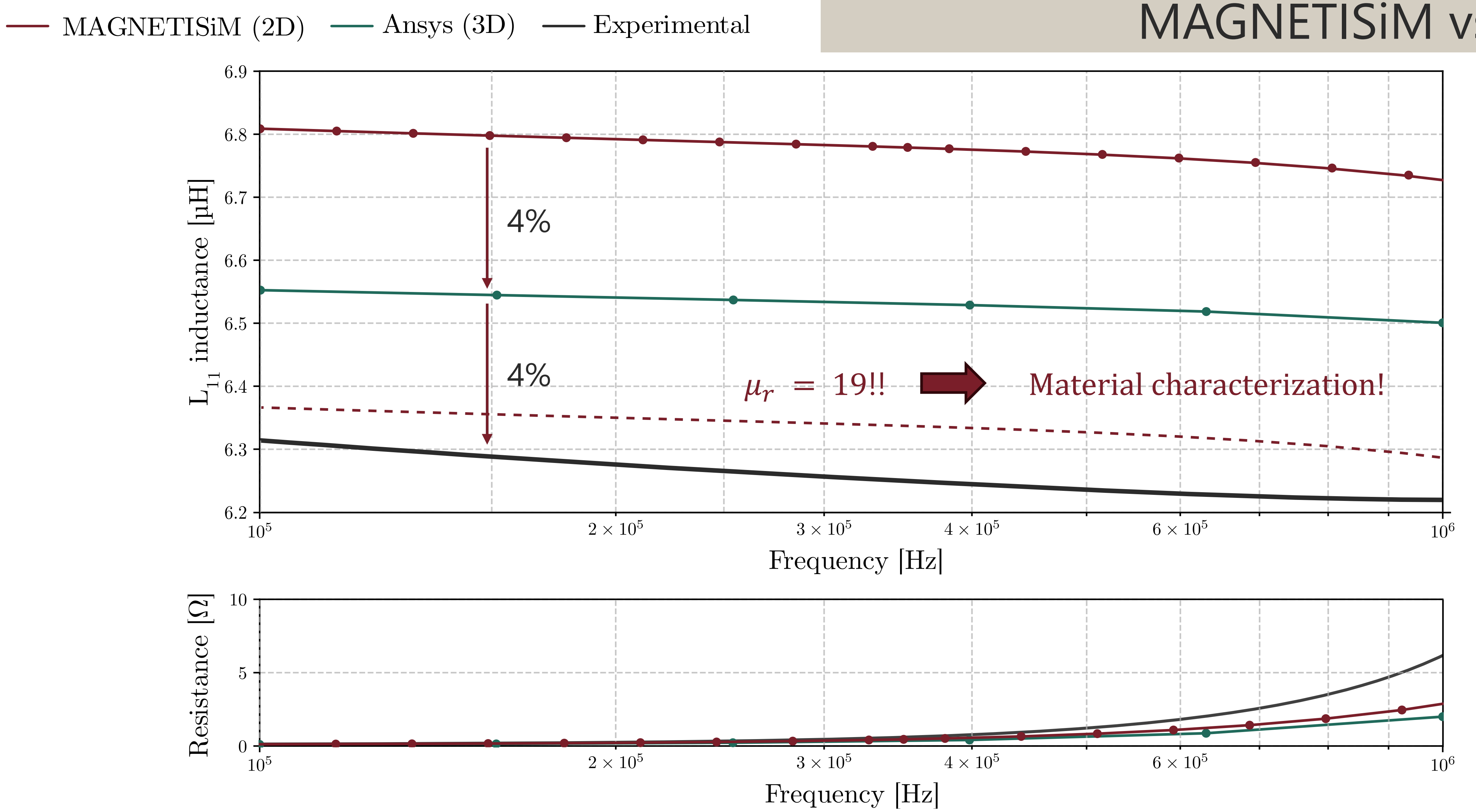
Simulation	7.87 µH
Measurement (μ_r=20)	6.26 µH
	+26% error

L_{11} @ $\mu_r = 20$

Simulation	6.77 µH
Measurement	6.26 µH
	+8% error

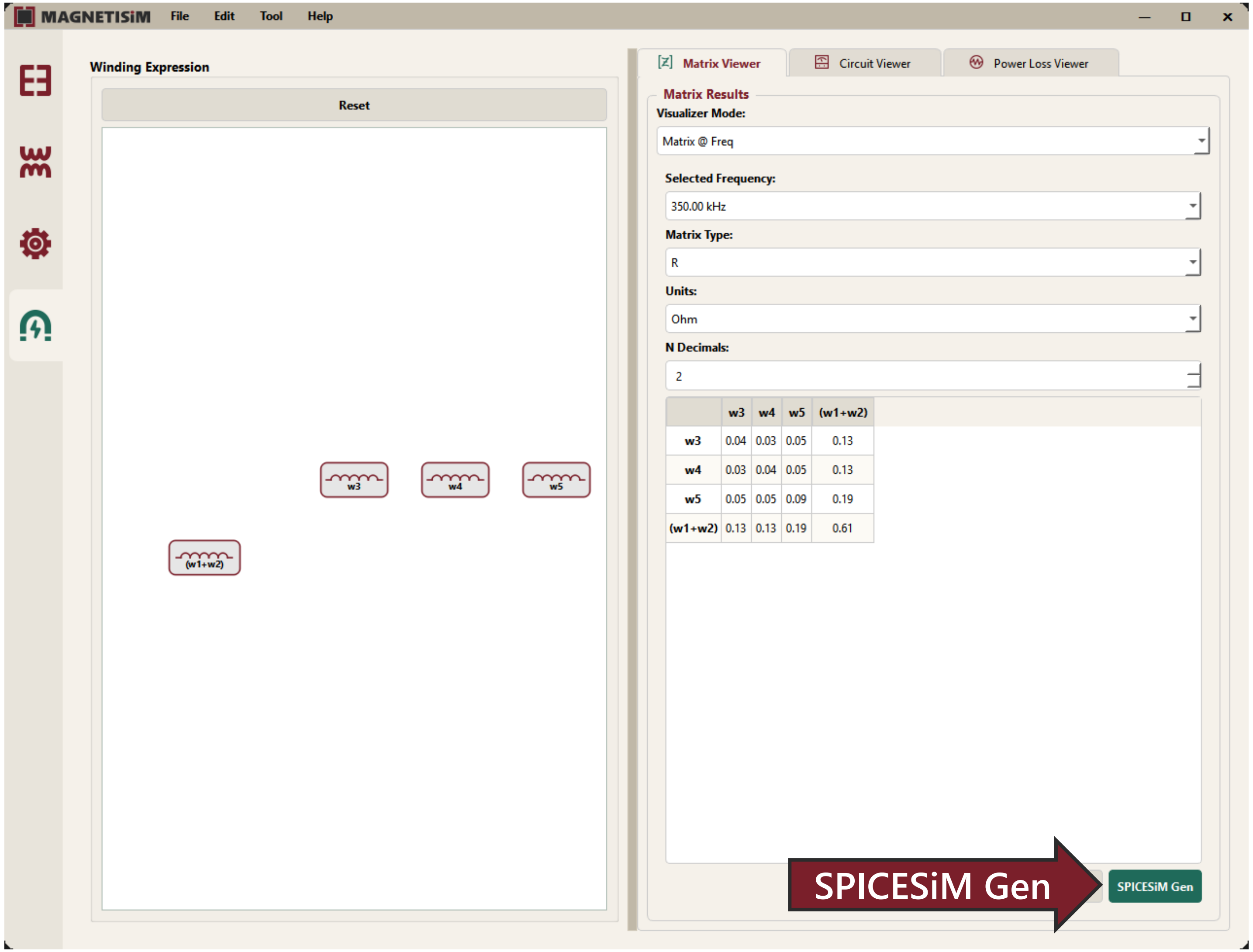
Results Postprocessing

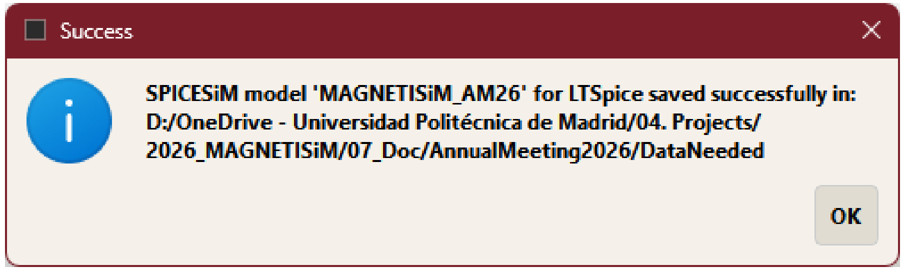
MAGNETISiM vs Ansys

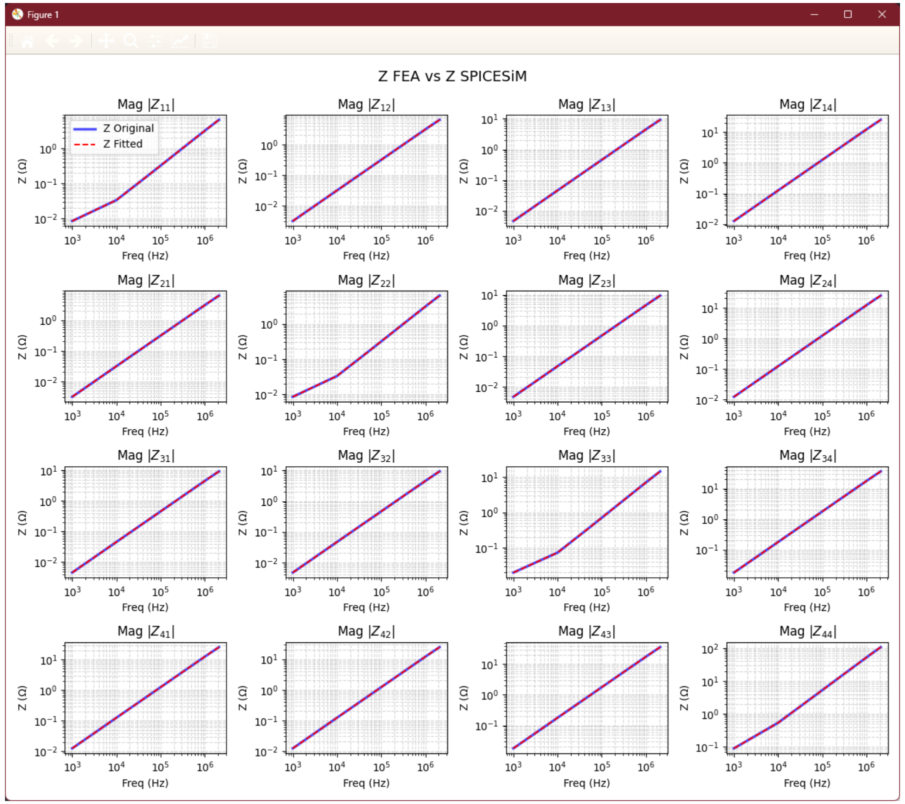


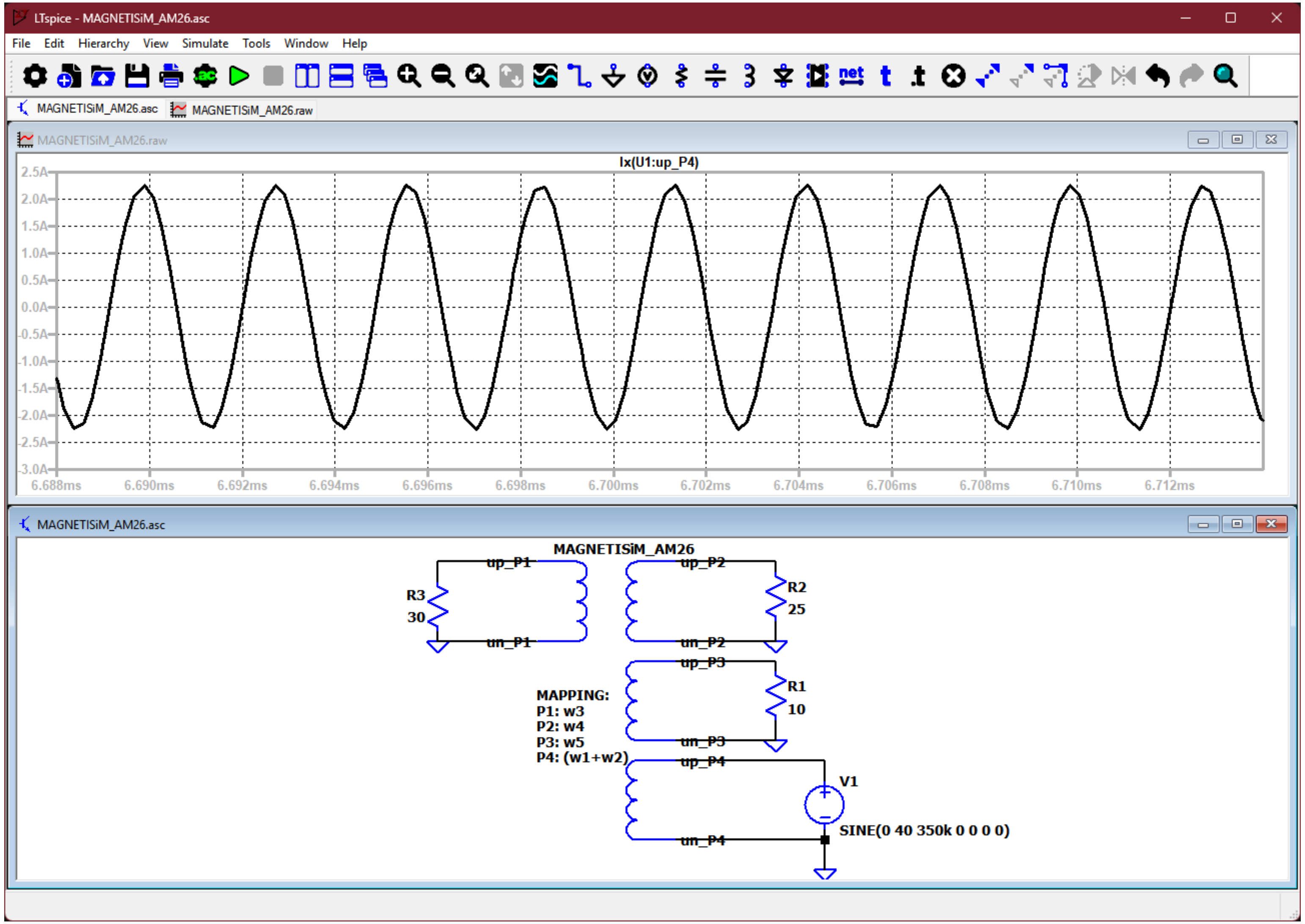
Results Postprocessing

SPICESiM (I)





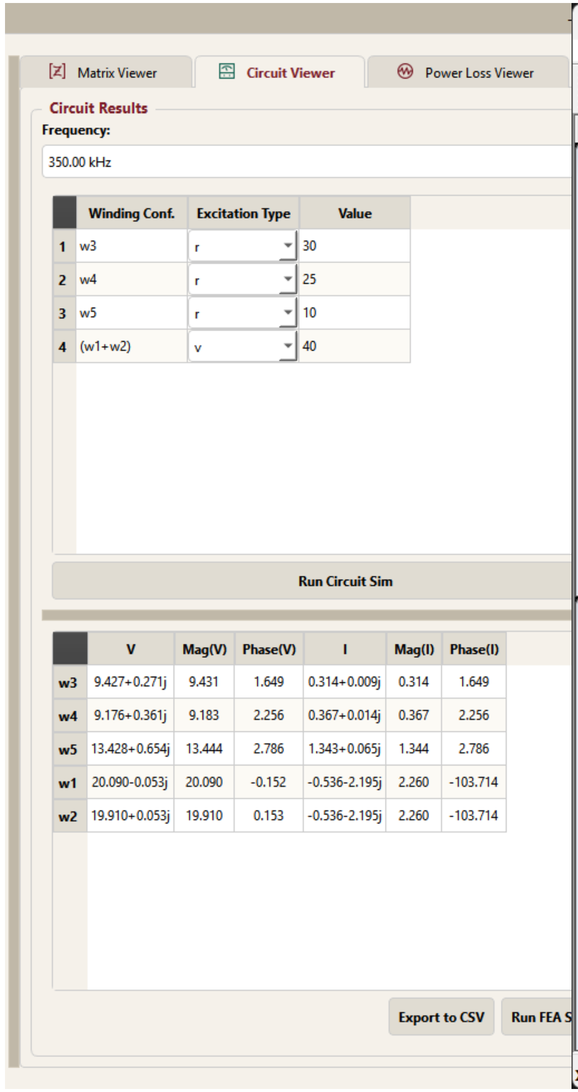




- AC analysis
- Transient analysis

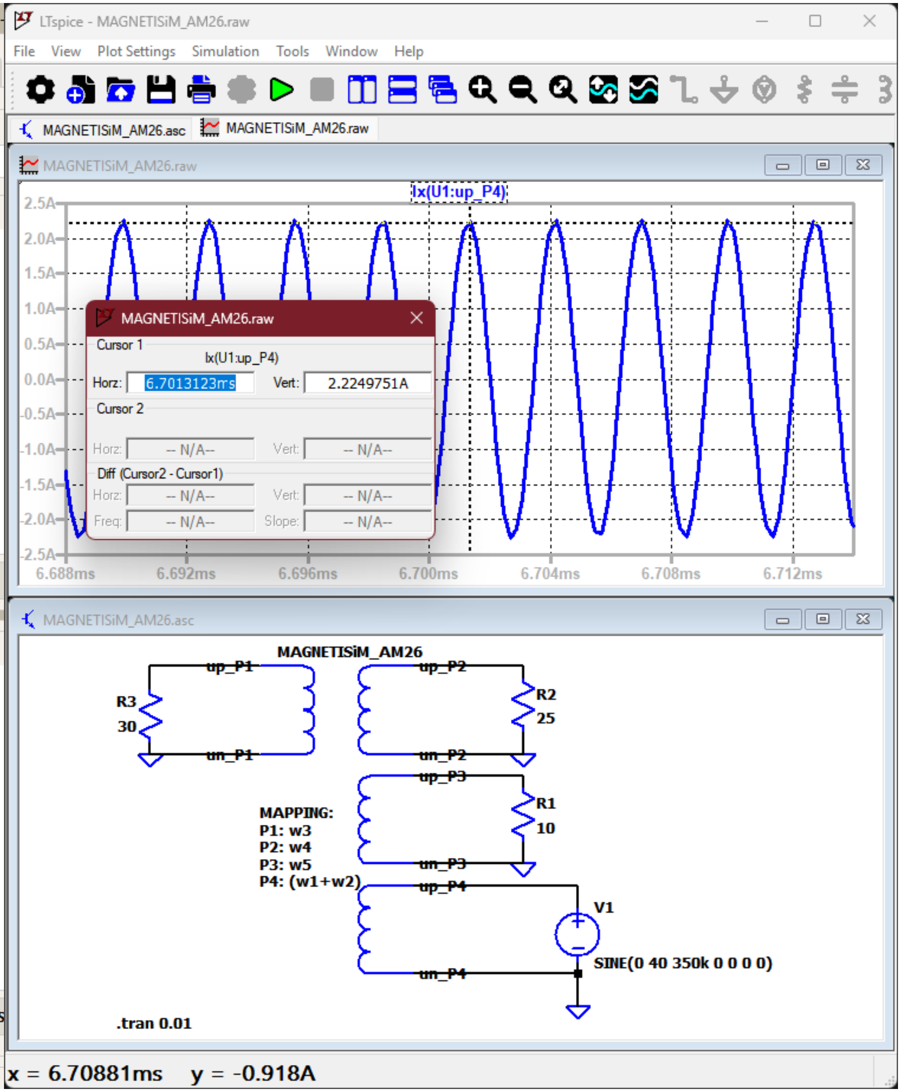
Results Postprocessing

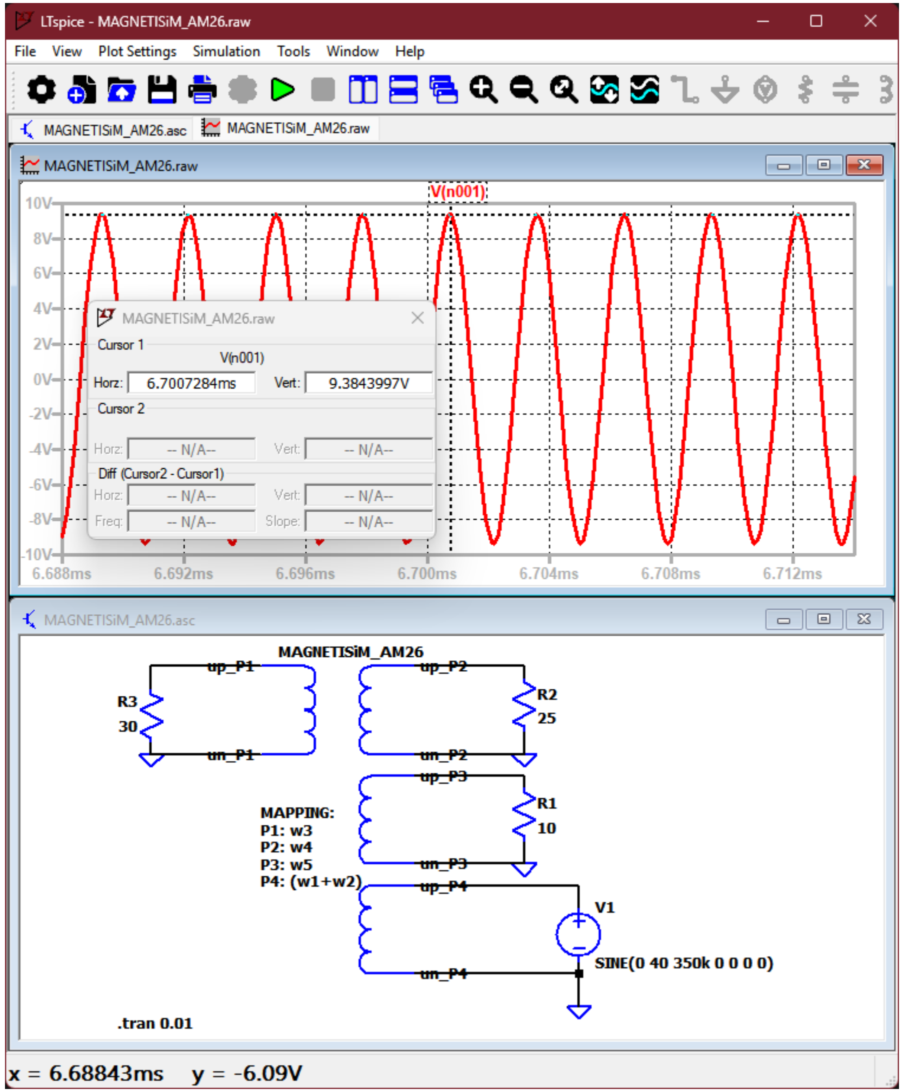
Circuit Viewer (I)

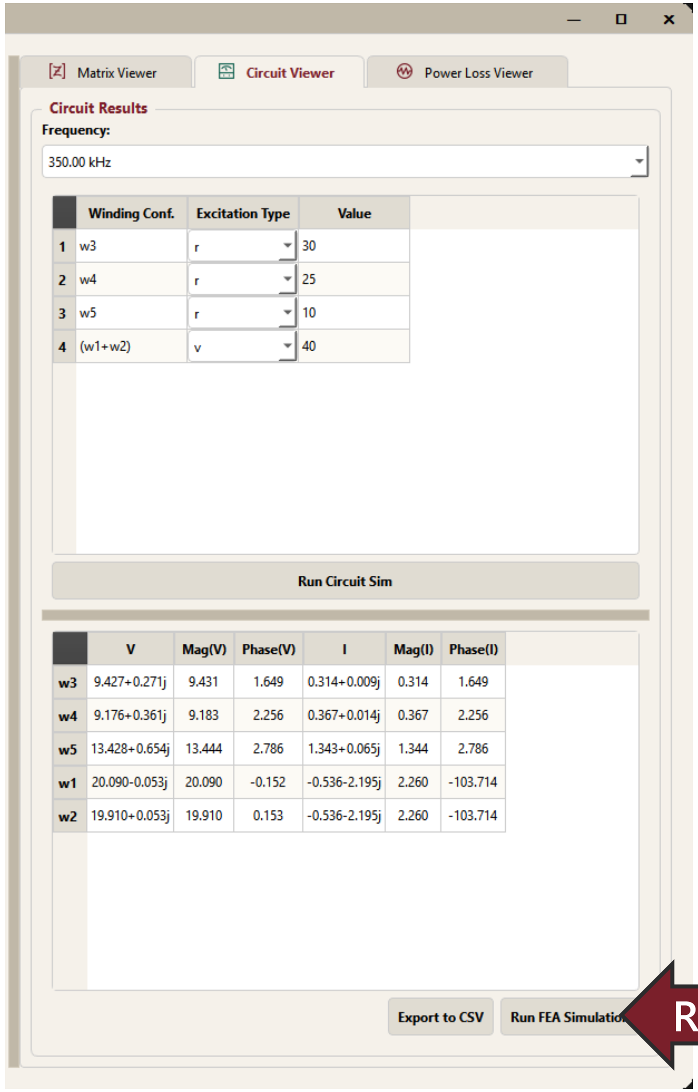


	Winding Conf.	Excitation Type	Value
1	w3	r	30
2	w4	r	25
3	w5	r	10
4	(w1+w2)	v	40

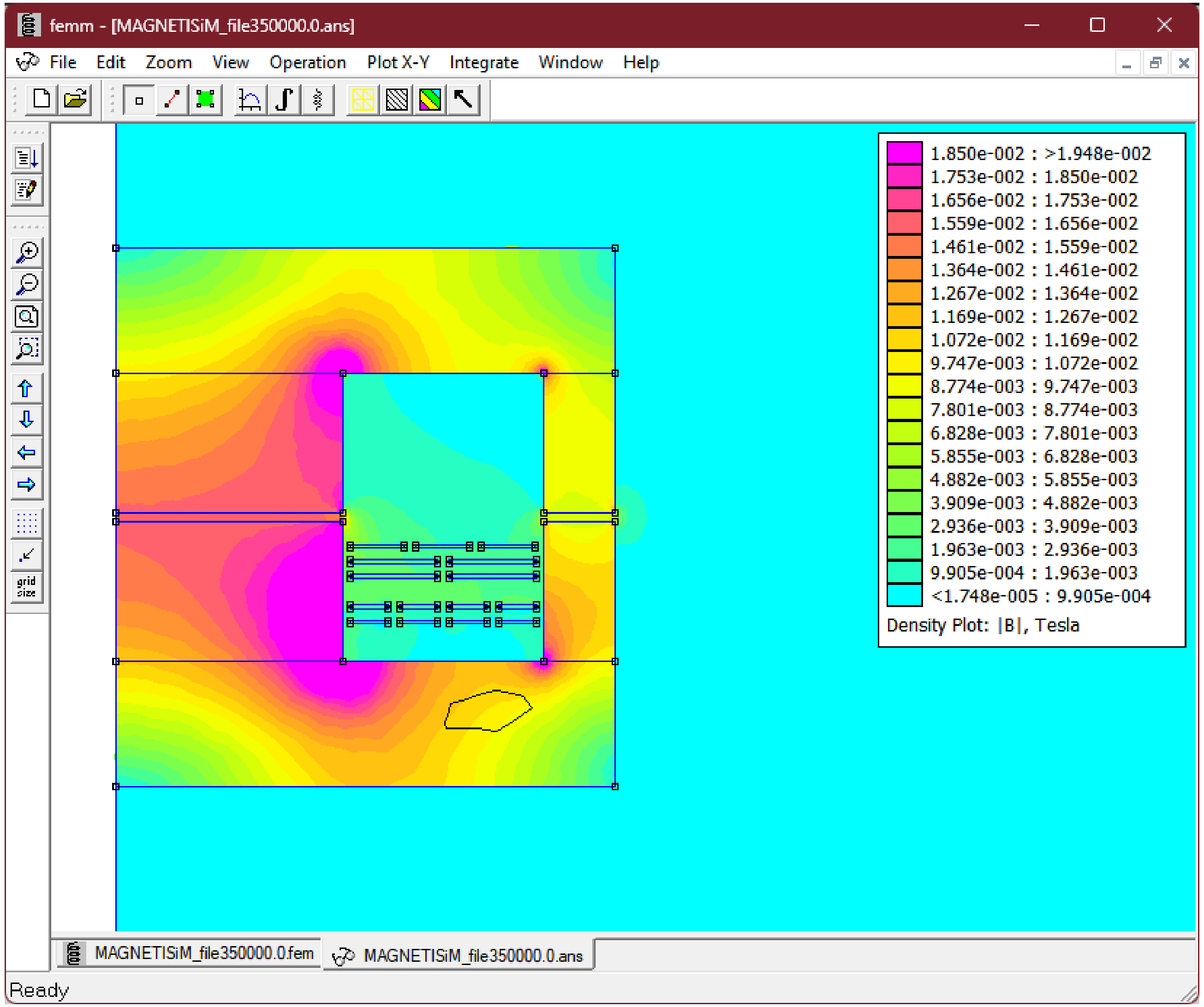
	V	Mag(V)	Phase(V)	I	Mag(I)	Phase(I)
w3	9.427+0.271j	9.431	1.649	0.314+0.009j	0.314	1.649
w4	9.176+0.361j	9.183	2.256	0.367+0.014j	0.367	2.256
w5	13.428+0.654j	13.444	2.786	1.343+0.065j	1.344	2.786
w1	20.090-0.053j	20.090	-0.152	-0.536-2.195j	2.260	-103.714
w2	19.910+0.053j	19.910	0.153	-0.536-2.195j	2.260	-103.714







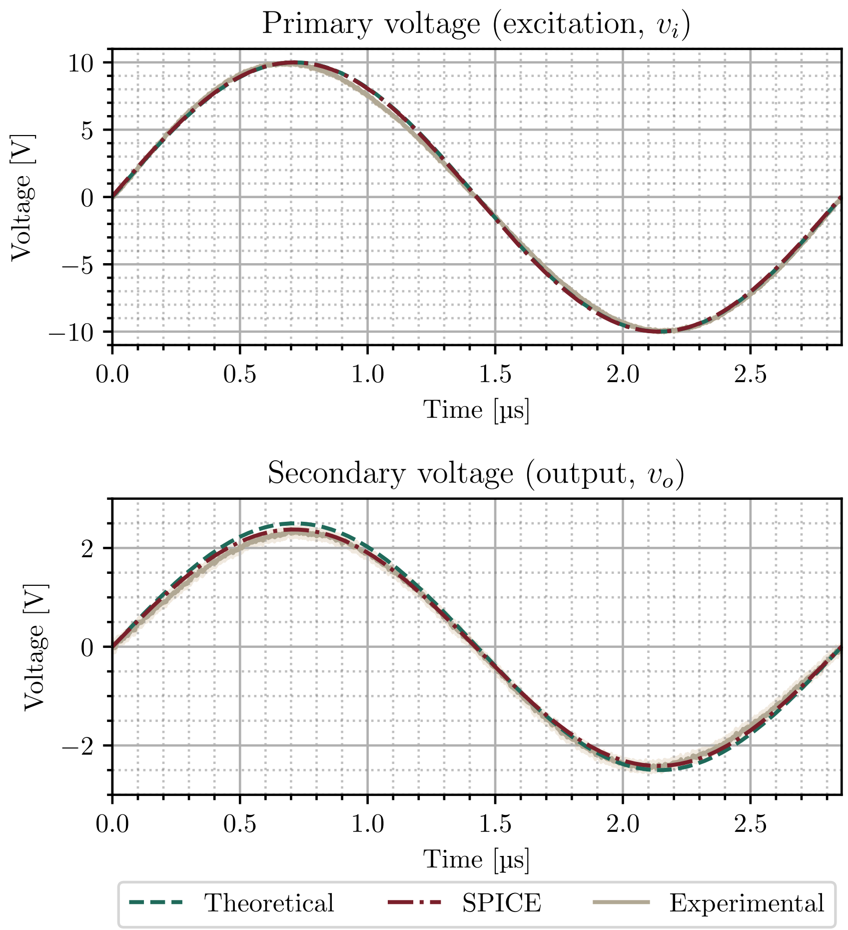
Run FEA Simulation



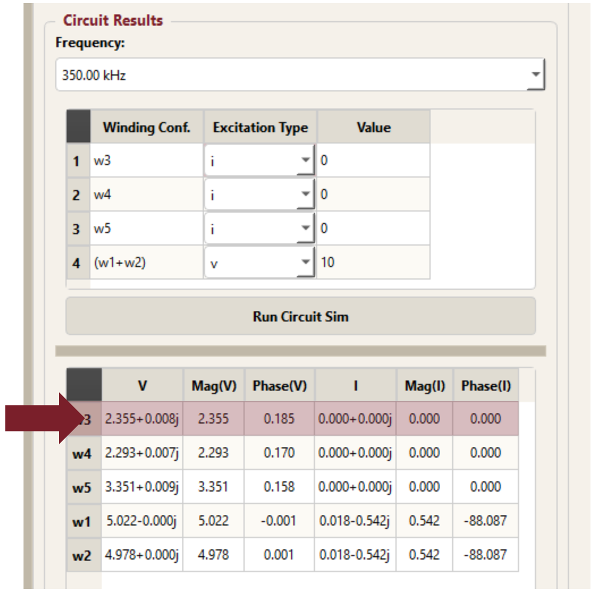
Circuit Viewer vs SPICESiM

MAGNETISiM vs Ansys

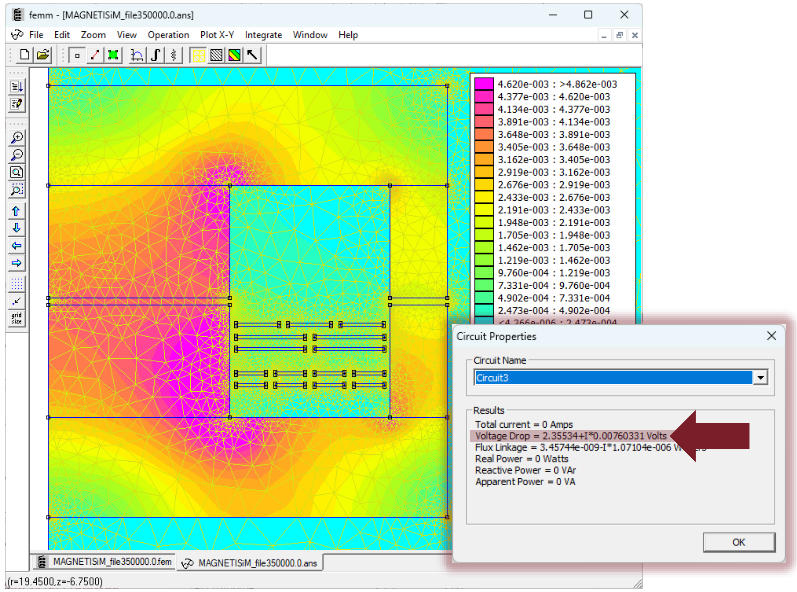
(a) Theoretical vs (d) SPICESiM vs (e) Prototype



(b) MAGNETISiM analytical



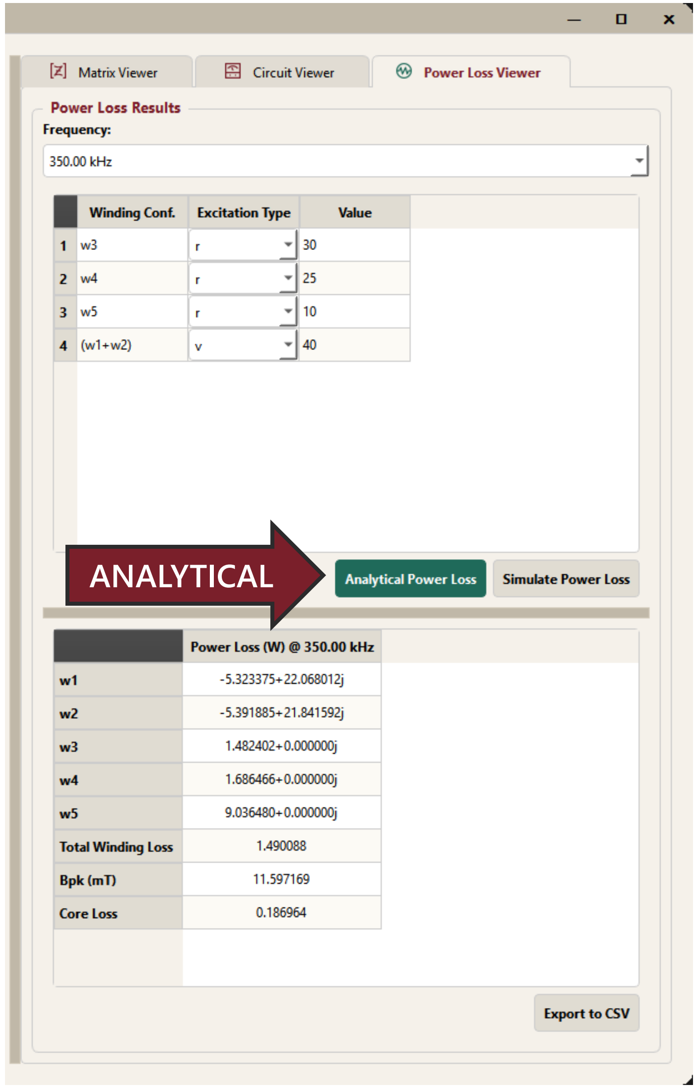
(c) MAGNETISiM simulation

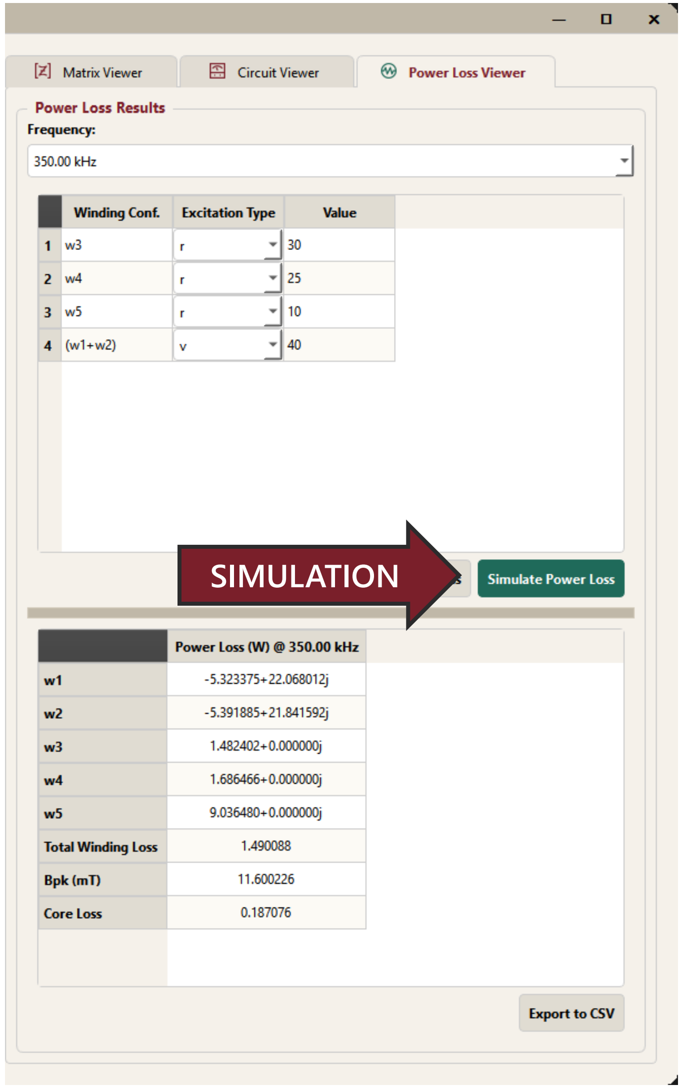


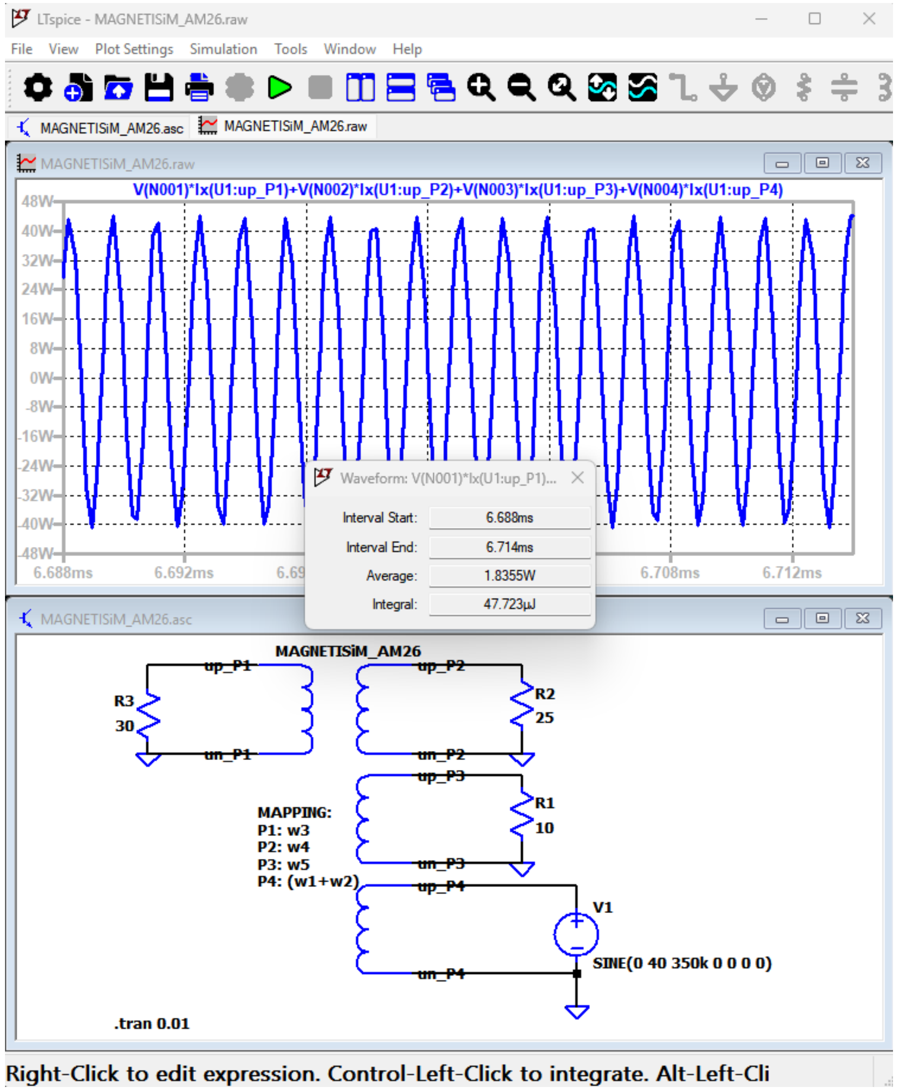
Source	Value [V]	Deviation
(a) Theoretical	2.50	1.11
(b) MAGNETISiM analytical	2.36	1.05
(c) MAGNETISiM simulation	2.36	1.05
(d) SPICESiM (LTspice)	2.30	1.02
(e) Prototype	2.25	1.00

Results Postprocessing

Power Loss Viewer (I)

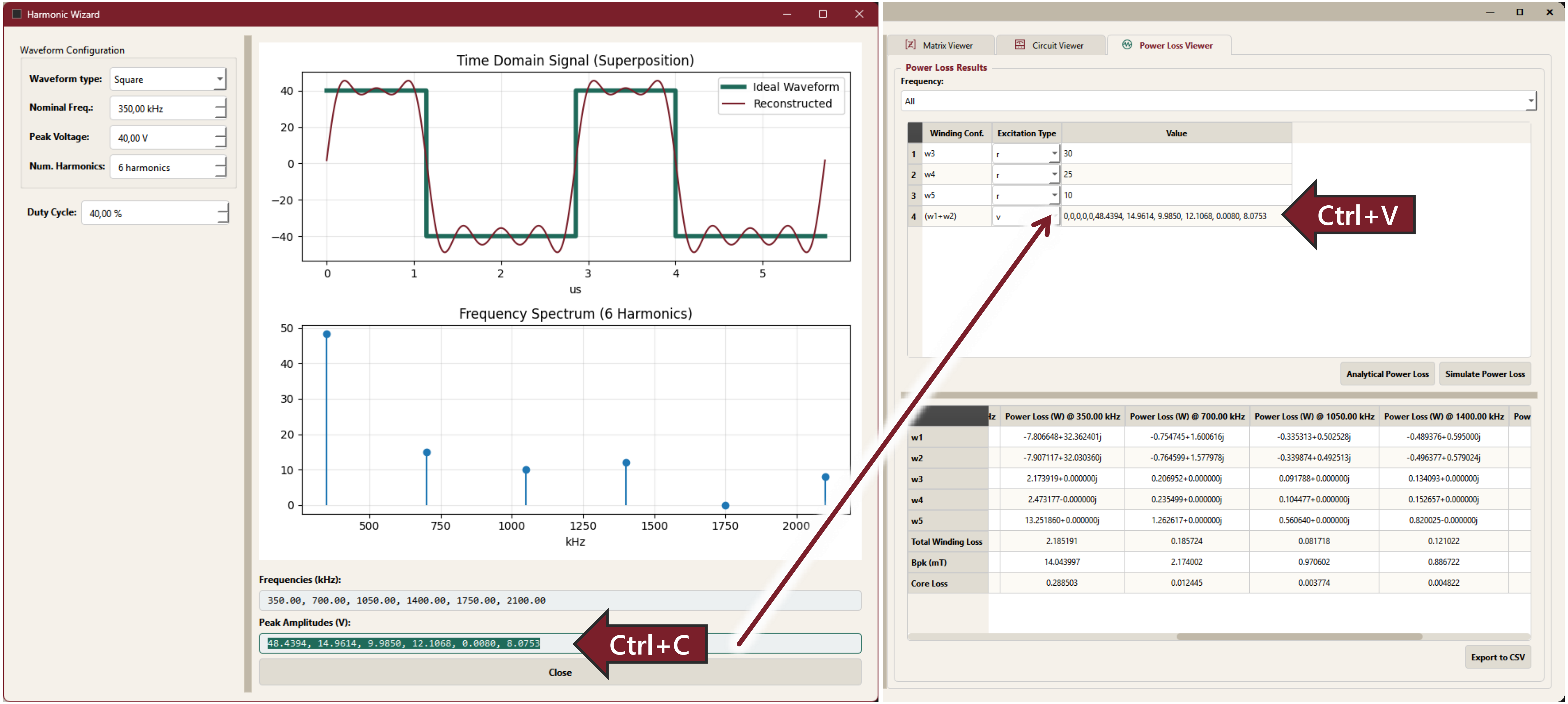






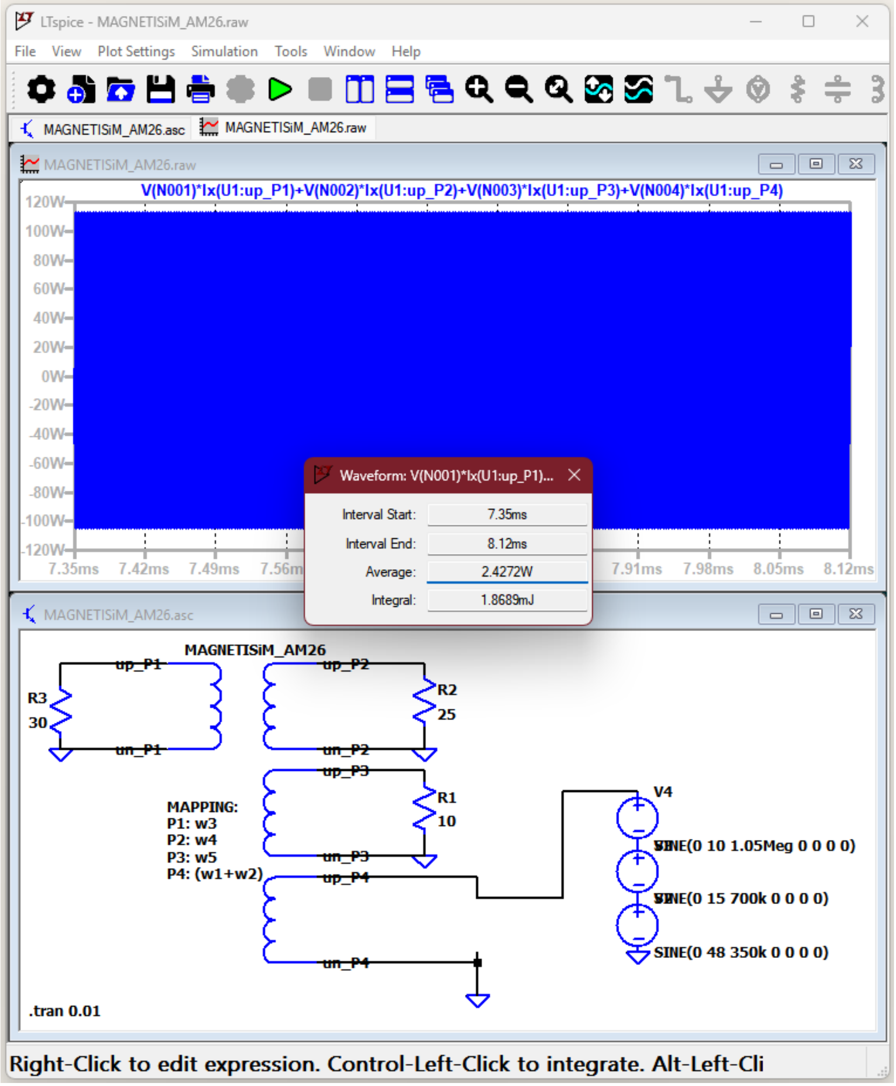
Results Postprocessing

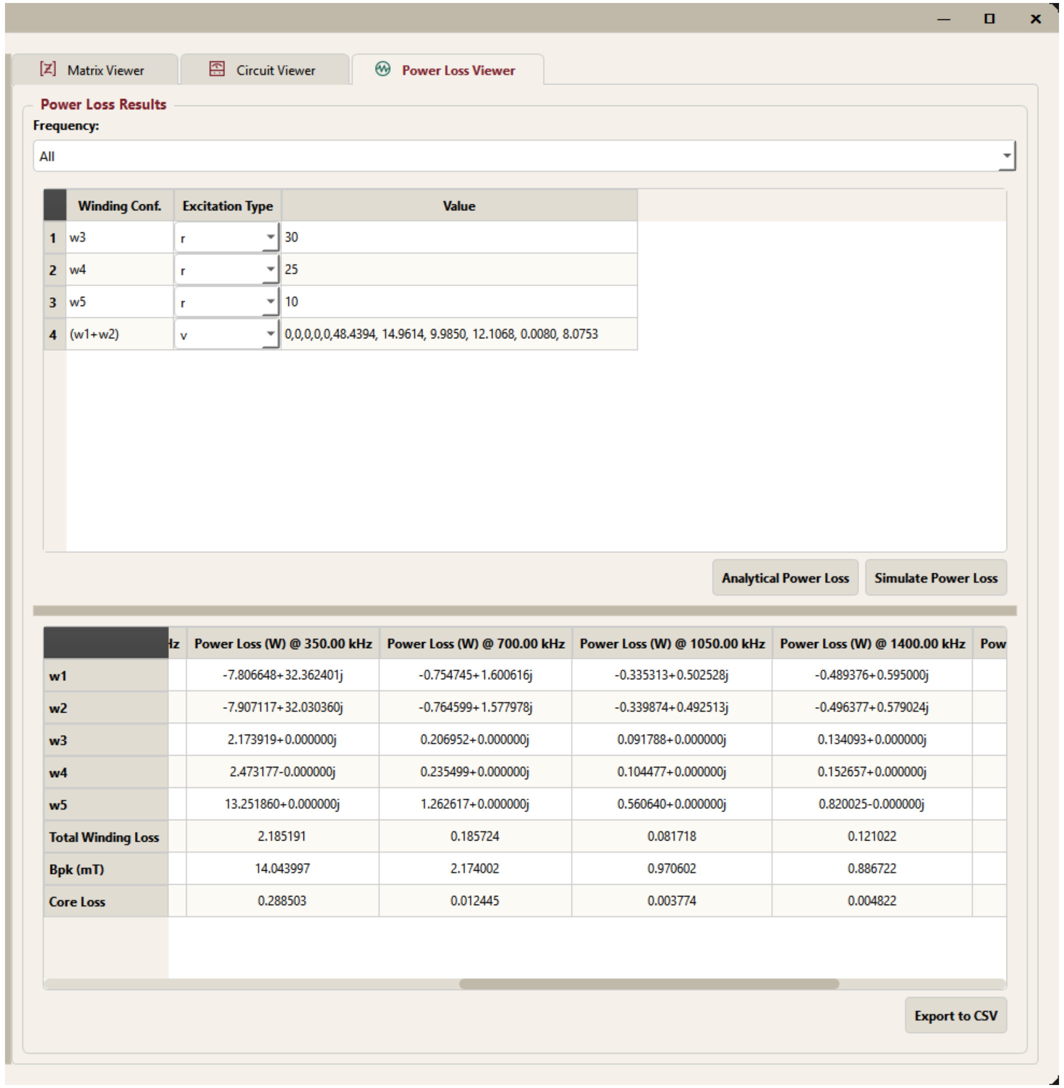
Power Loss Viewer (II)



Results Postprocessing

Power Loss Viewer (III)



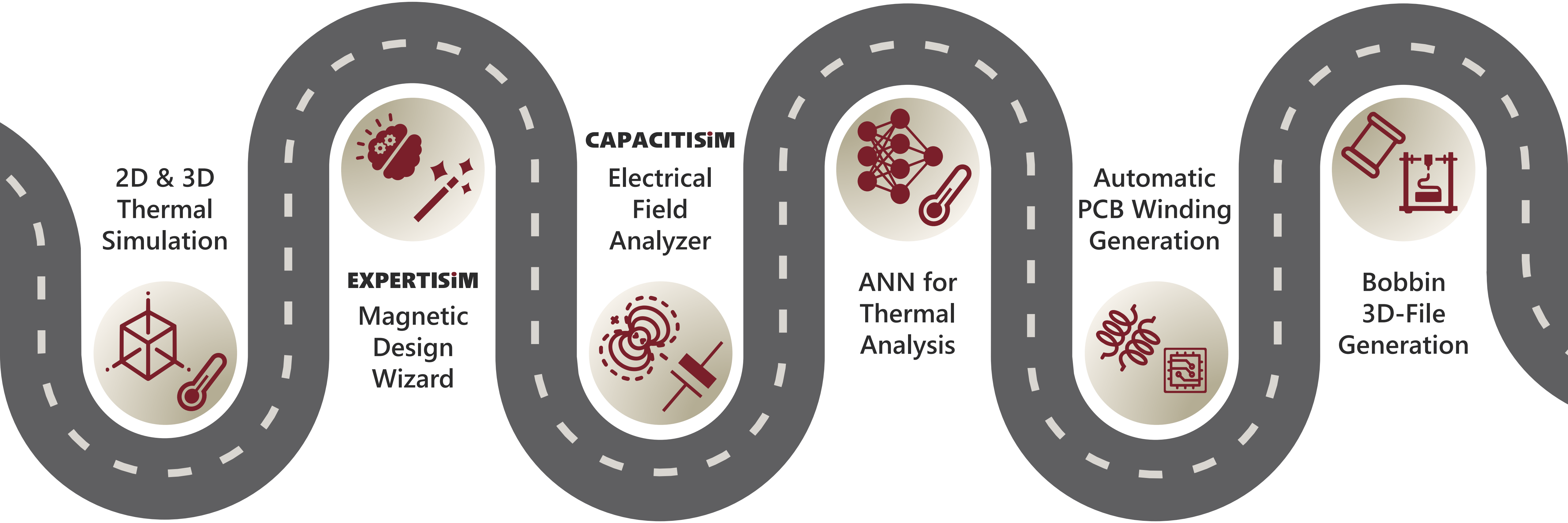


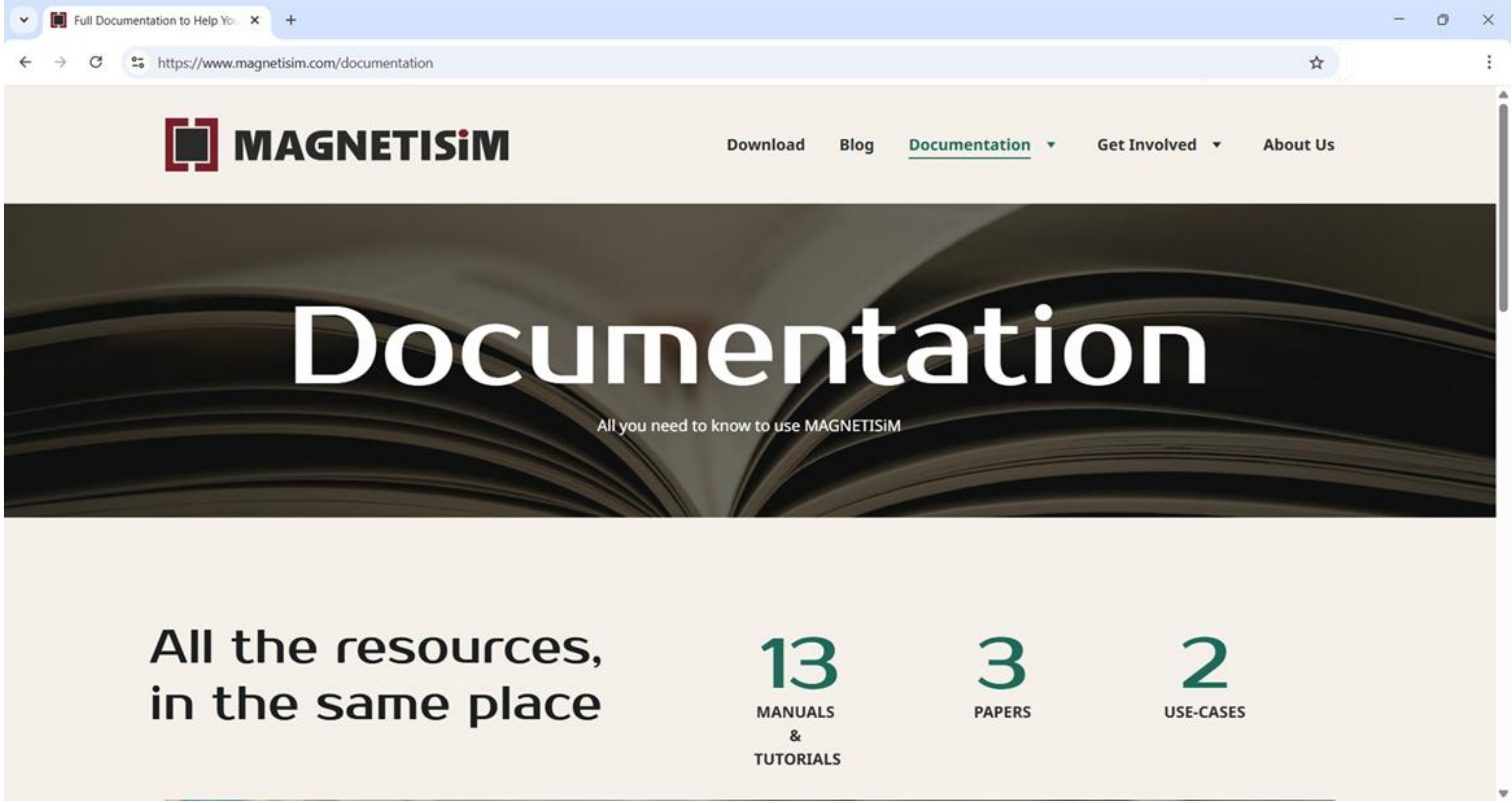
04

And That's a Wrap

- Roadmap
- Where to Find Us
- The Team

MAGNETISiM Roadmap

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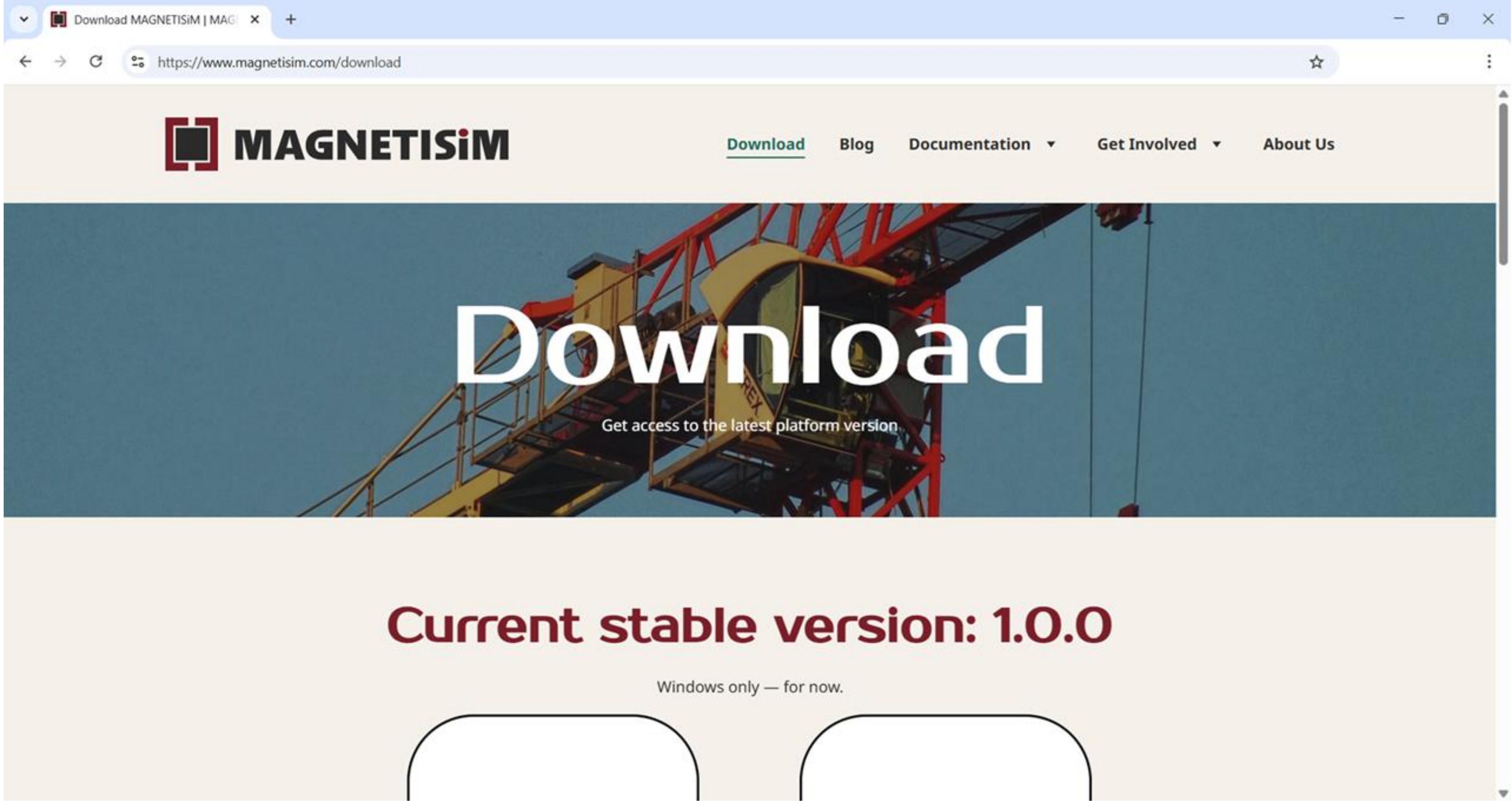

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Q & A

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