MAGNETISiM

Create Material

www.magnetisim.com

GUI Overview

TAB MENU

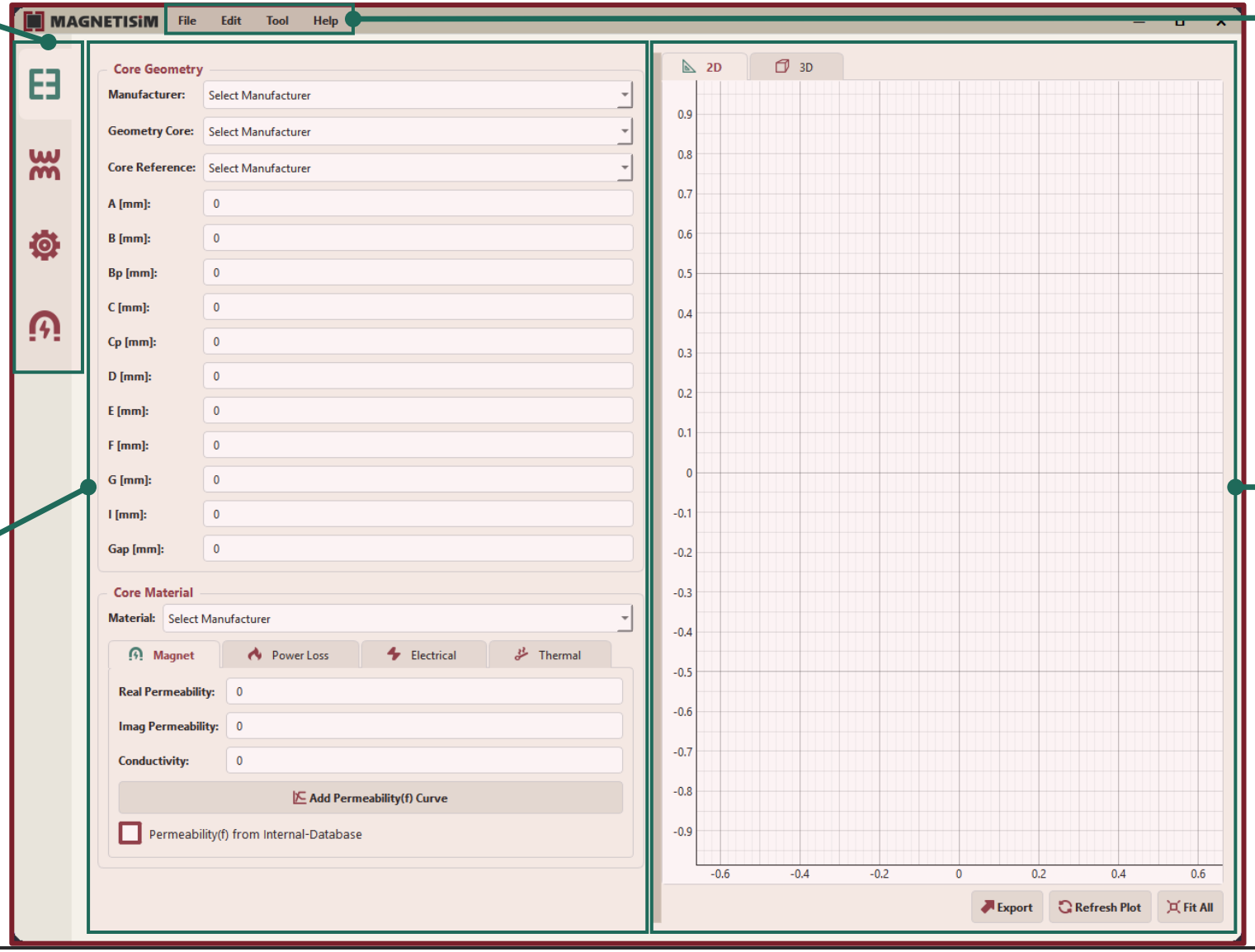
Core Geometry Tab (Ctrl+1)

Winding Geometry Tab (Ctrl+2)

Sim Config Tab (Ctrl+3)

Magnet Tab (Ctrl+4)

INPUT FRAME

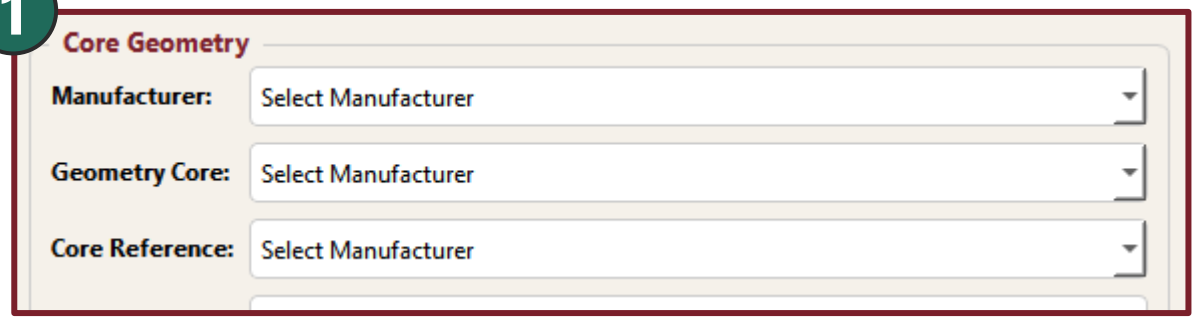


BAR TOOL

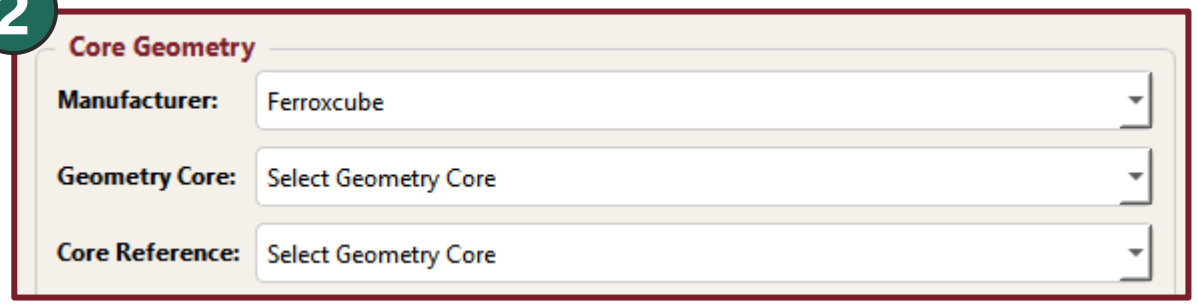
MODELER WINDOW

Core Geometry Selection

1



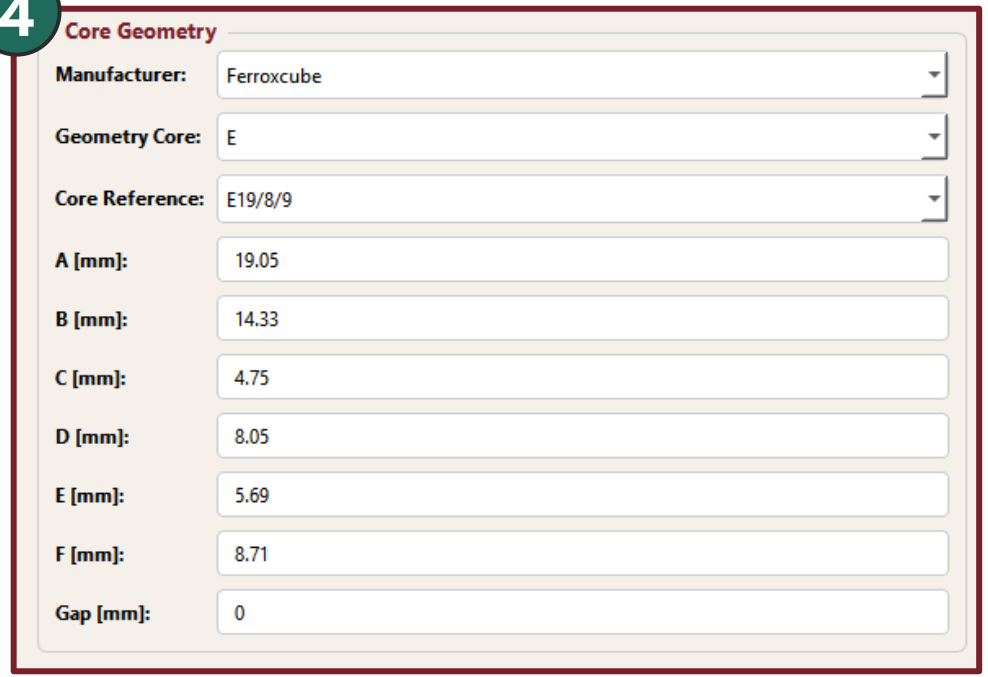
2



3

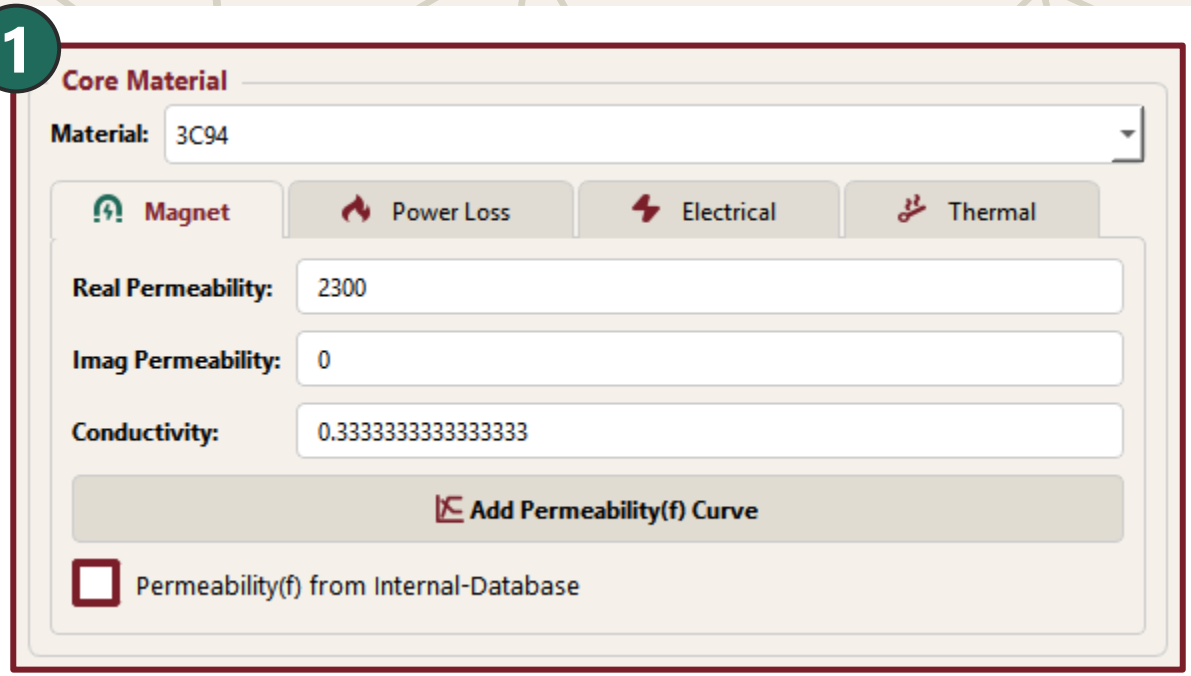
❶ Select the **manufacturer** from the menu (e.g., Ferroxcube).
❷ Select the core **geometry** (e.g., the "E" model).
❸ Select the core **reference** (e.g., E19/8/9).
❹ The system **automatically** loads the core parameters from the built-in database.

4



Legends in ***Create Magnetic Core***

Core Material Selection



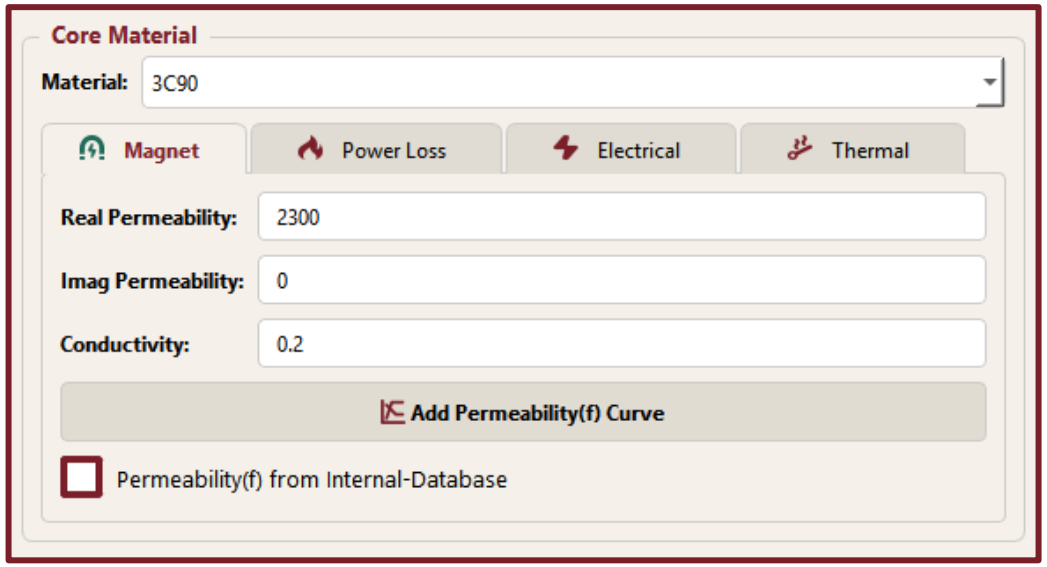
❶ Select the **material** from the menu (e.g., 3C94). The system **automatically** loads the material parameters from the built-in database.

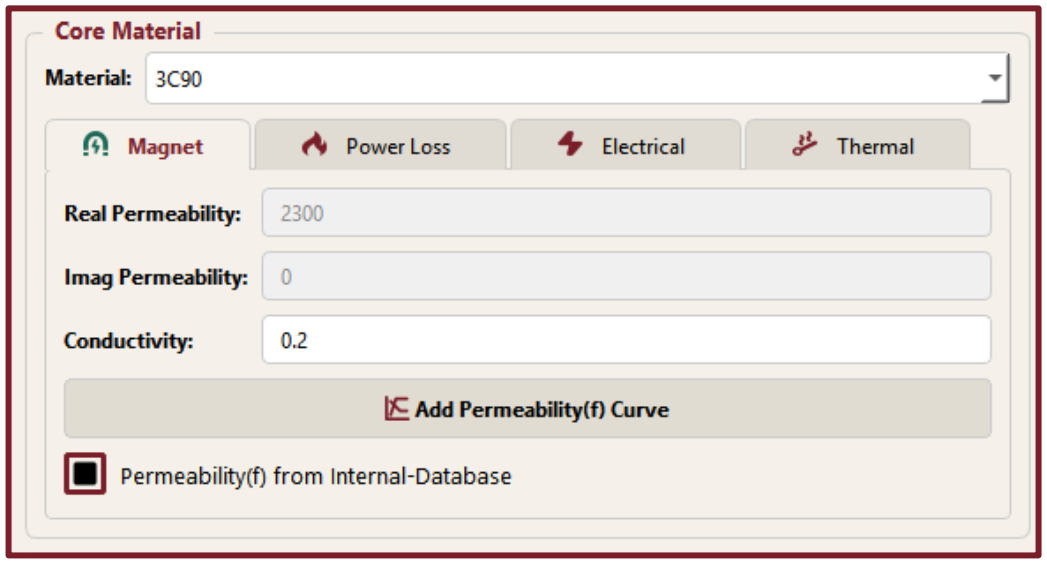
CORE MATERIAL CHARACTERIZATION

- **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 will be released in September 2026.

More information in ***Create Material***

Magnet Definition





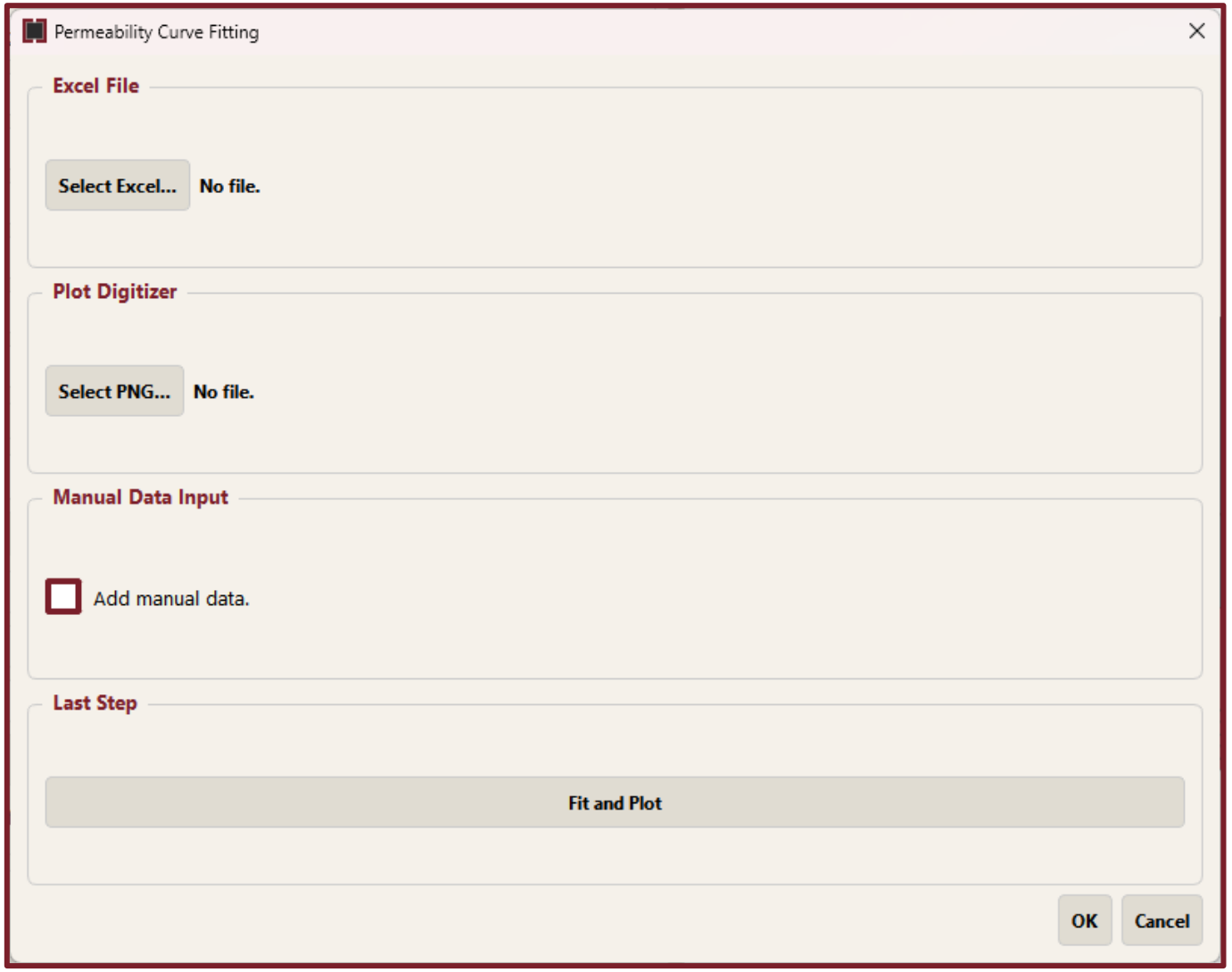
SINGLE-FREQUENCY MATERIAL CHARACTERIZATION

- **Magnet**
  $\mu_r' - j\mu_r''$ – Complex permeability
  Conductivity – Electrical Conductivity

MULTI-FREQUENCY MATERIAL CHARACTERIZATION

- **Add Permeability Curve** or **From Internal-Database**
  However, materials often vary with frequency. To capture this, click the "**Add Permeability(f) Curve**" button to define these parameters dynamically.

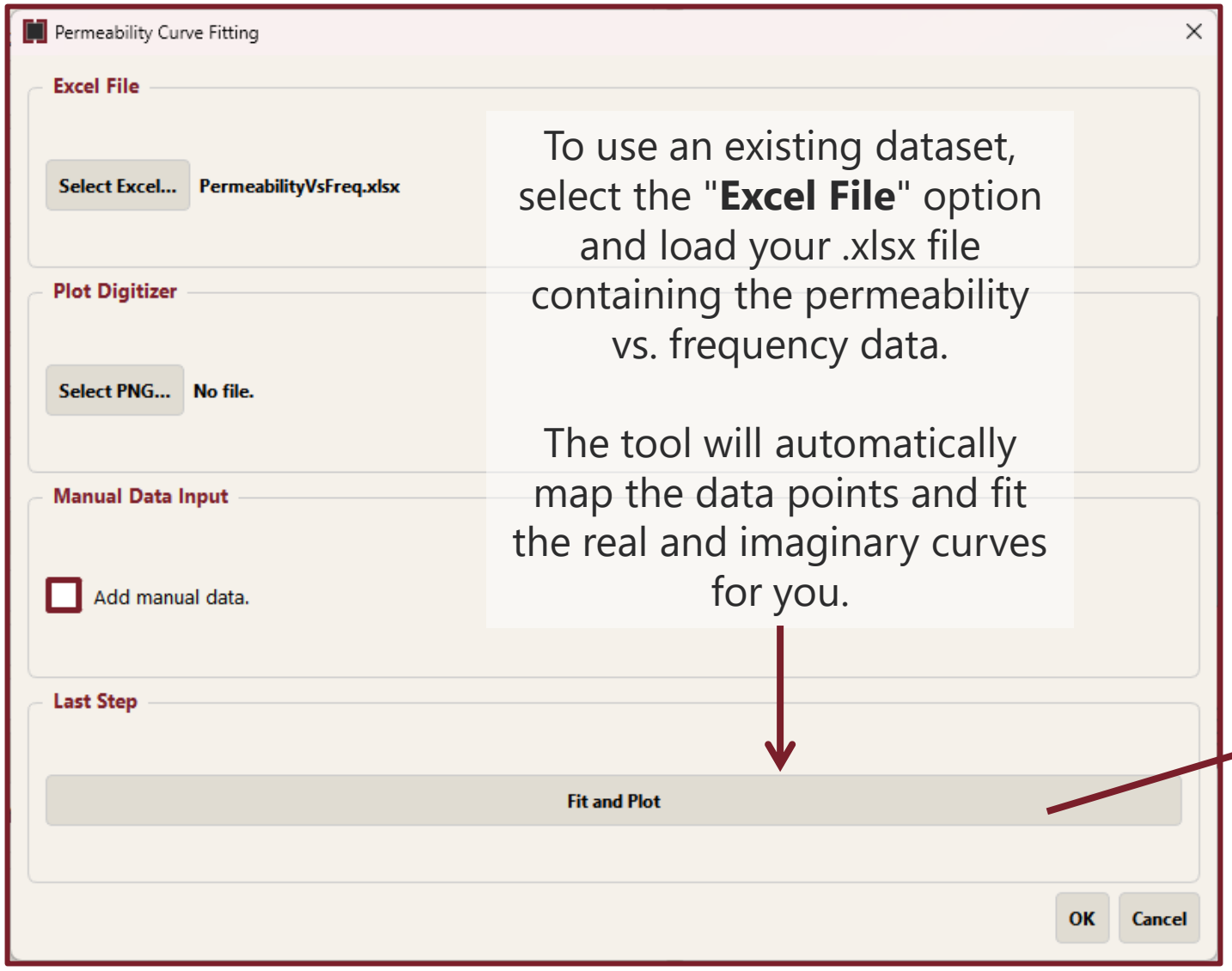
Permeability Curve Fitting



Clicking the curve button opens the "**Permeability Curve Fitting**" window, which offers three methods:

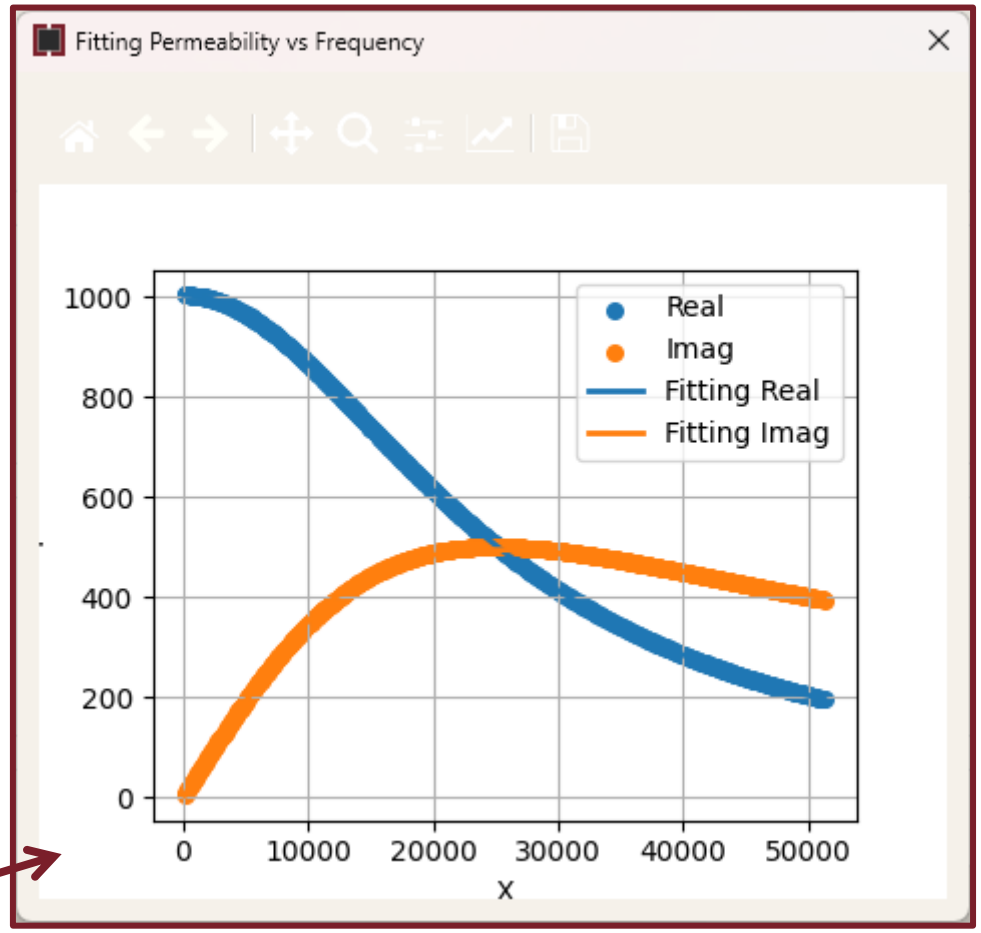
- **Excel File**
- **Plot Digitizer**
- **Manual Data Input**

Permeability Curve Fitting – Excel File



To use an existing dataset, select the "**Excel File**" option and load your .xlsx file containing the permeability vs. frequency data.

The tool will automatically map the data points and fit the real and imaginary curves for you.



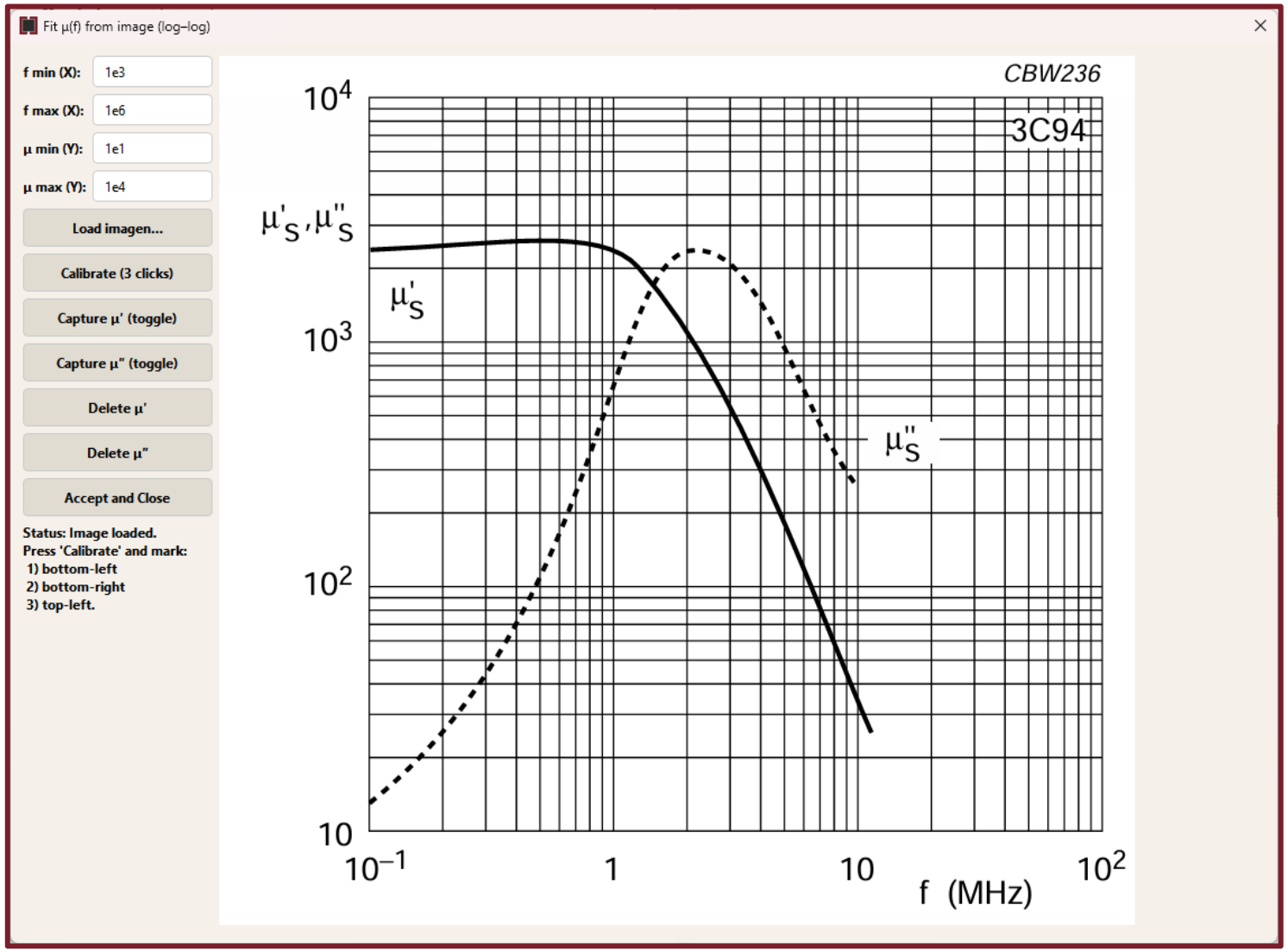
Open template in github

Permeability Curve Fitting – Plot Digitizer

If you only have a datasheet image, use the **Plot Digitizer**.

Open template in github

Permeability Curve Fitting – Plot Digitizer

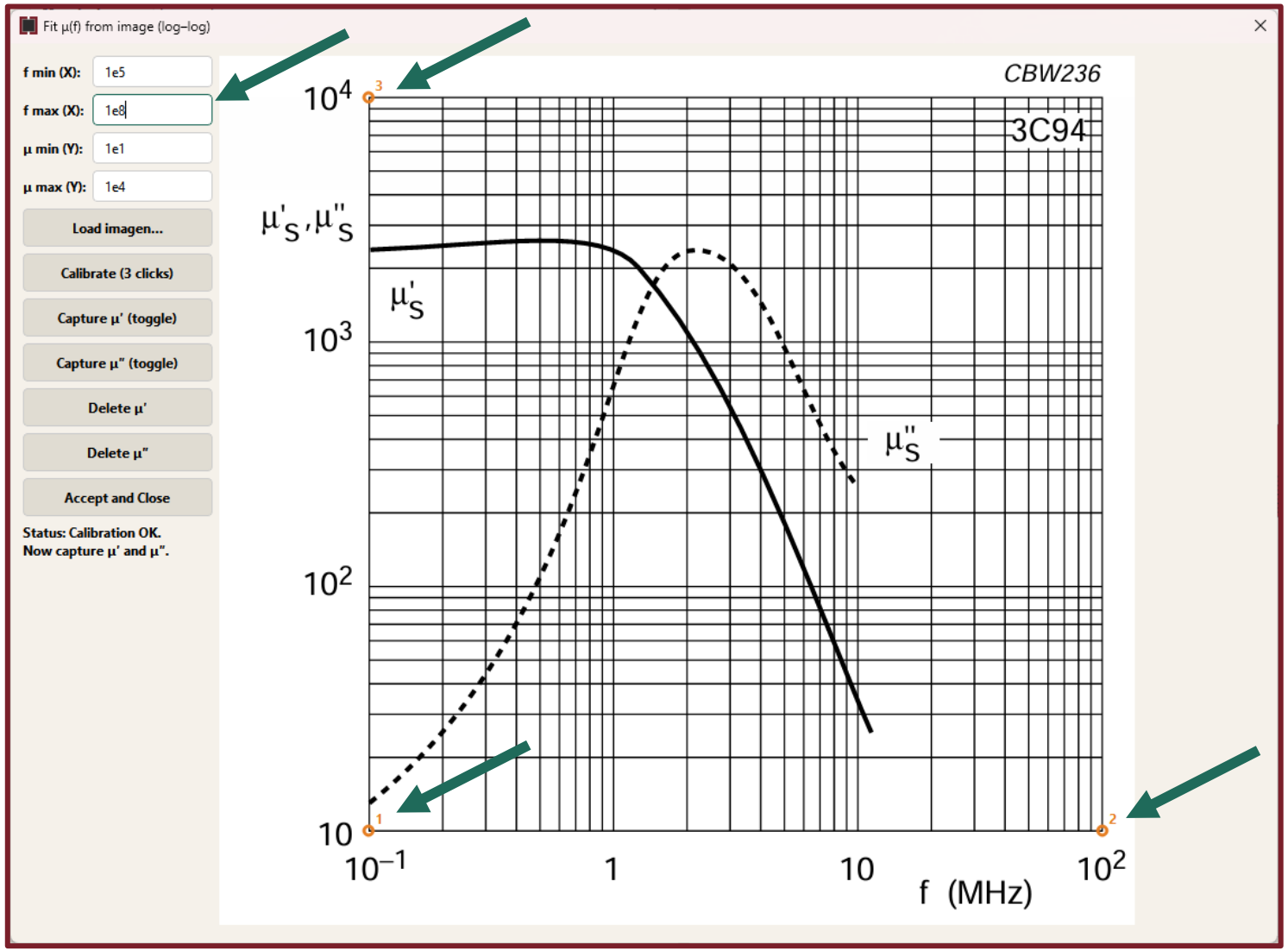


If you only have a datasheet image, use the **Plot Digitizer**.

Step 1: Click "Load imagen..." to import your log-log graph of permeability.

Open template in github

Permeability Curve Fitting – Plot Digitizer



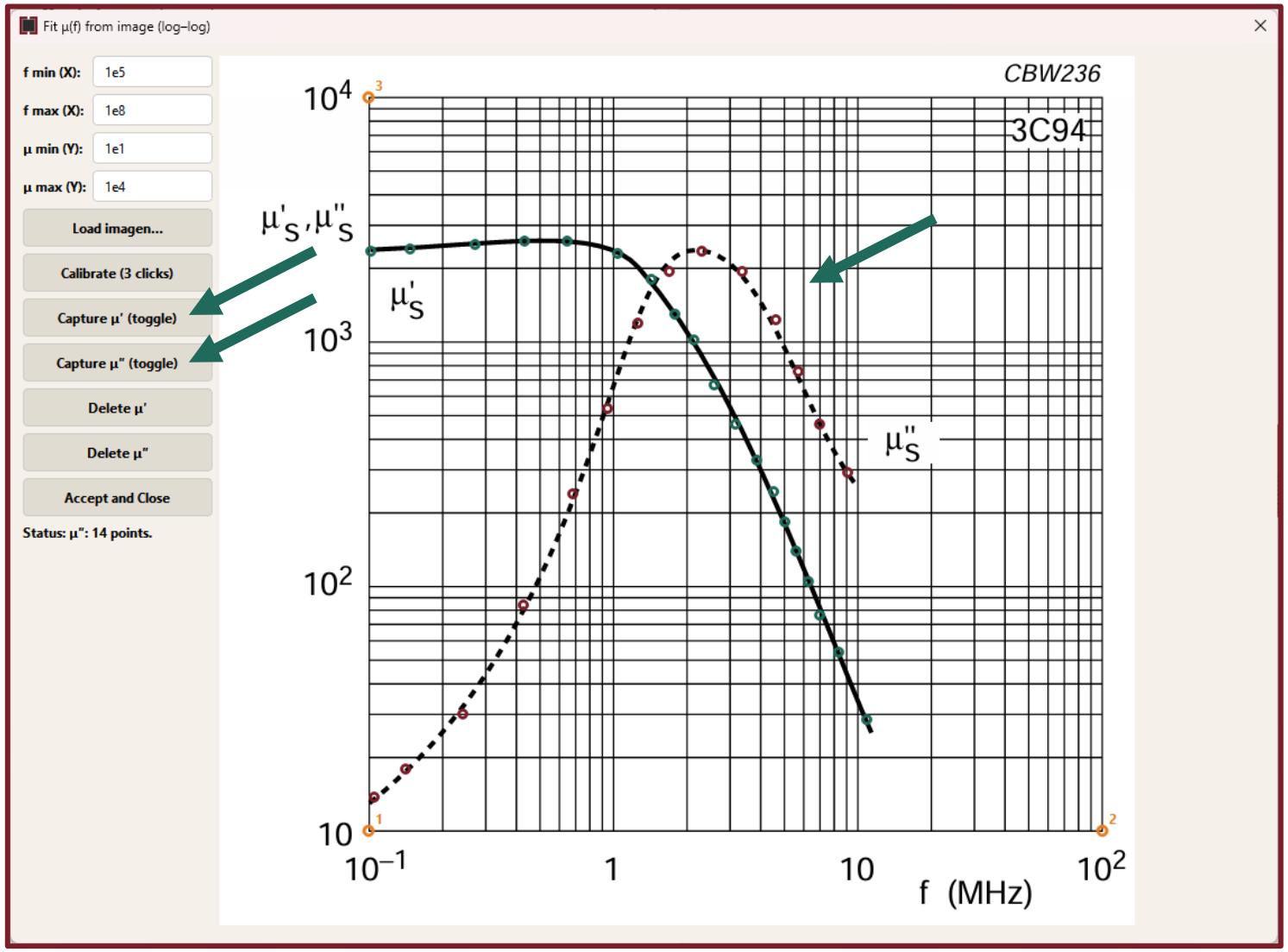
If you only have a datasheet image, use the **Plot Digitizer**.

Step 1: Click "Load imagen..." to import your log-log graph of permeability.

Step 2: Click "Calibrate" and select 3 reference points on the axes to set the scale.

Open template in github

Permeability Curve Fitting – Plot Digitizer



If you only have a datasheet image, use the **Plot Digitizer**.

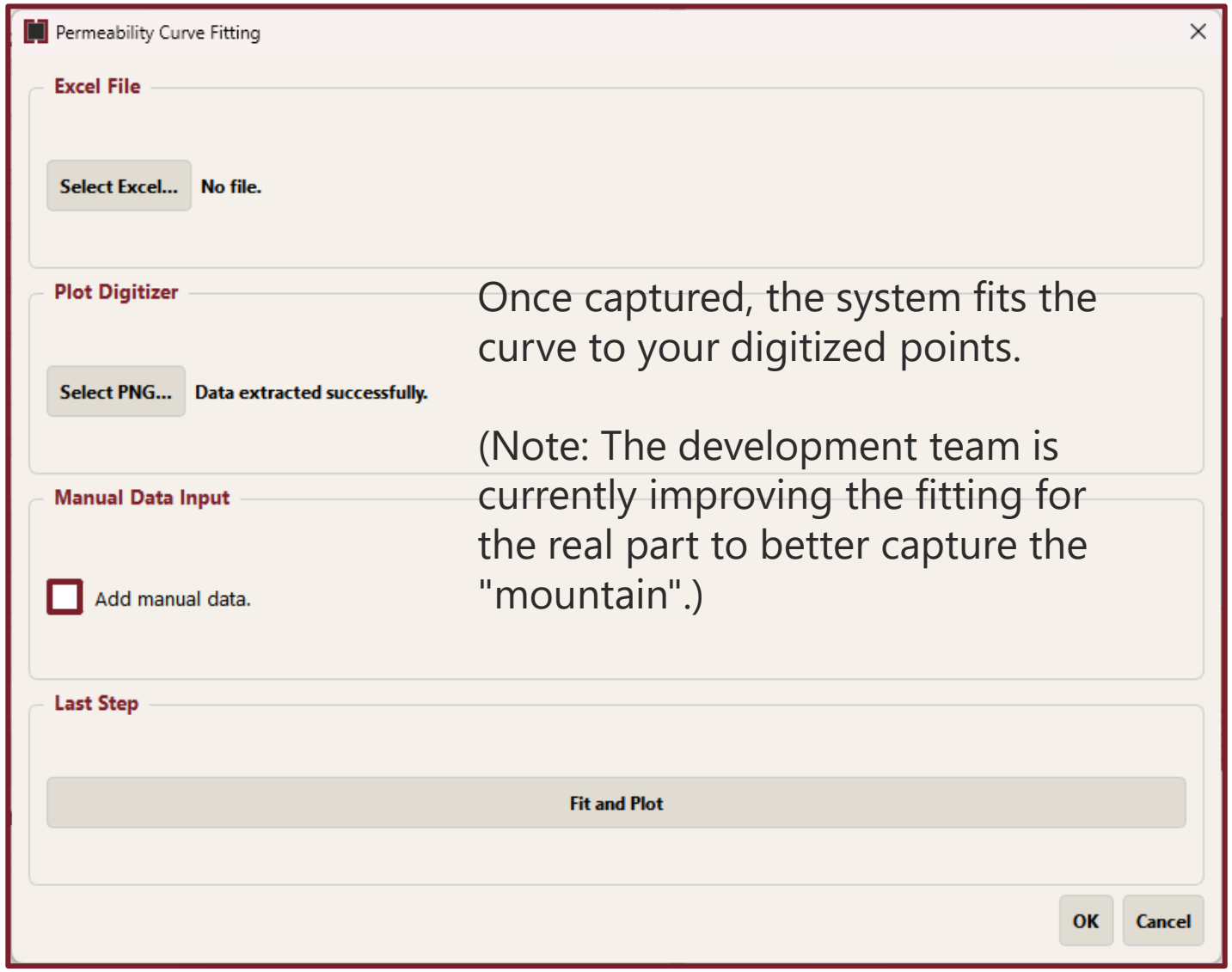
Step 1: Click "Load imagen..." to import your log-log graph of permeability.

Step 2: Click "Calibrate" and select 3 reference points on the axes to set the scale.

Step 3: Capture the data by clicking along the curves on the image.

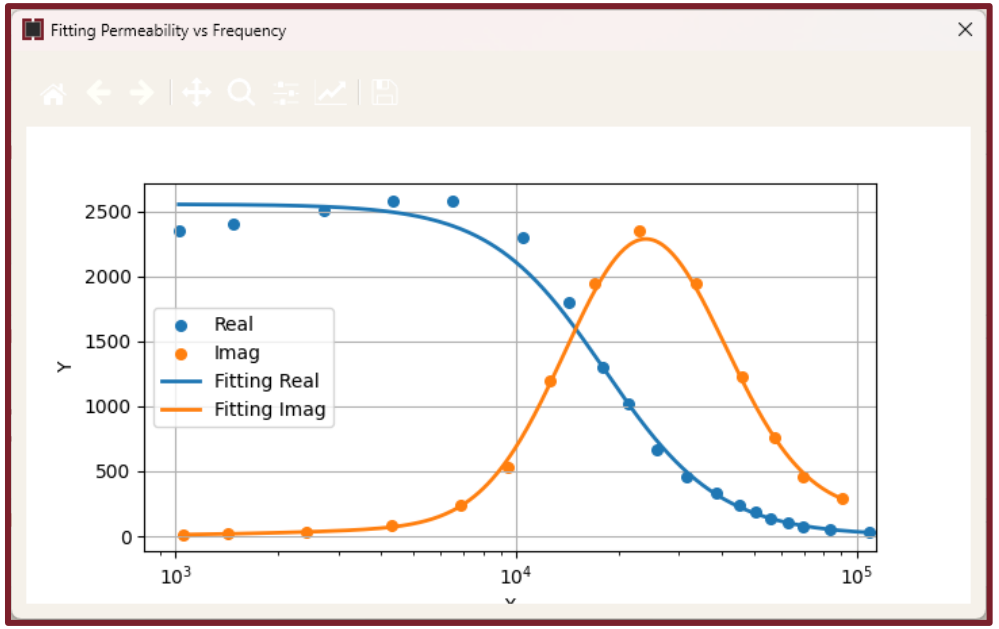
Open template in github

Permeability Curve Fitting – Plot Digitizer



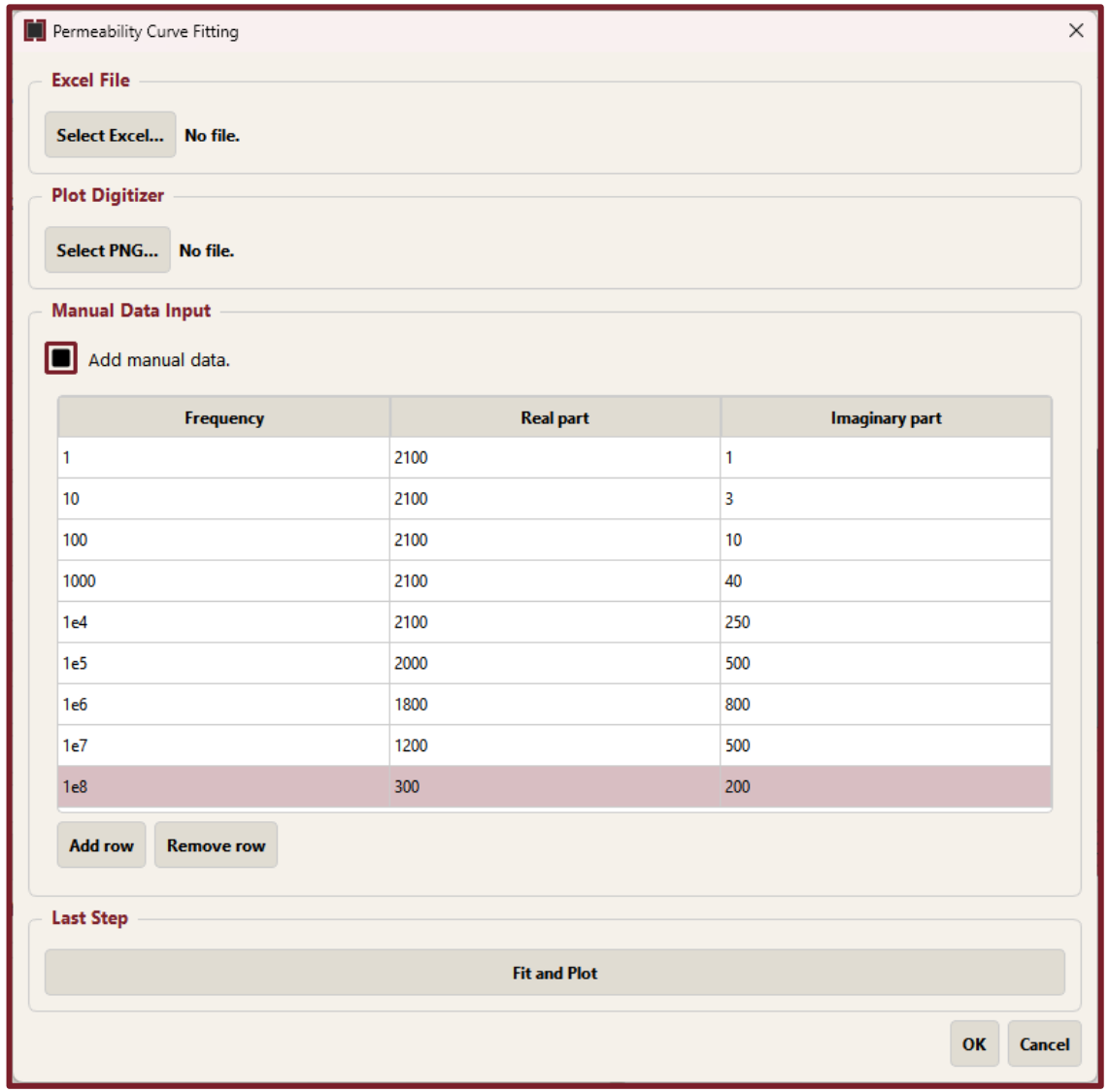
Once captured, the system fits the curve to your digitized points.

(Note: The development team is currently improving the fitting for the real part to better capture the "mountain".)

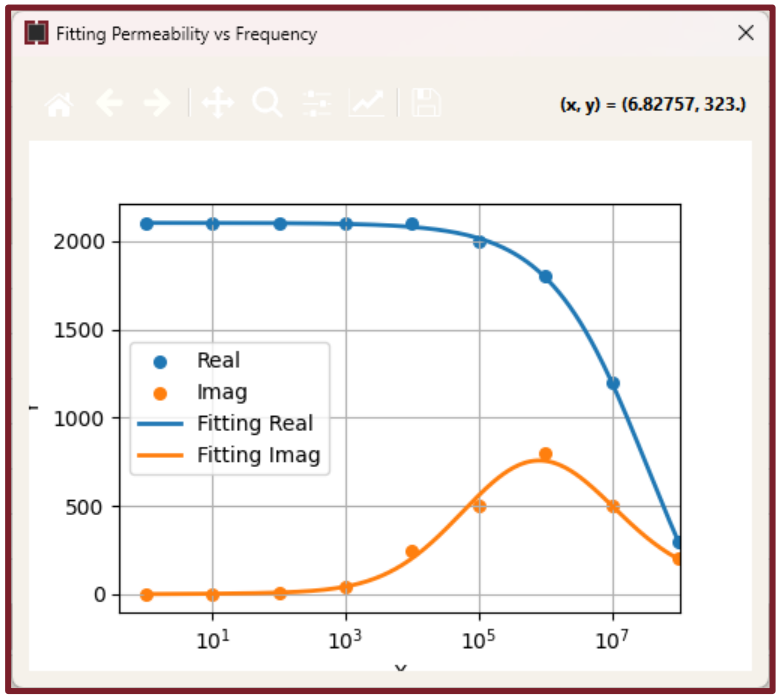


Open template in github

Permeability Curve Fitting – Manual Input

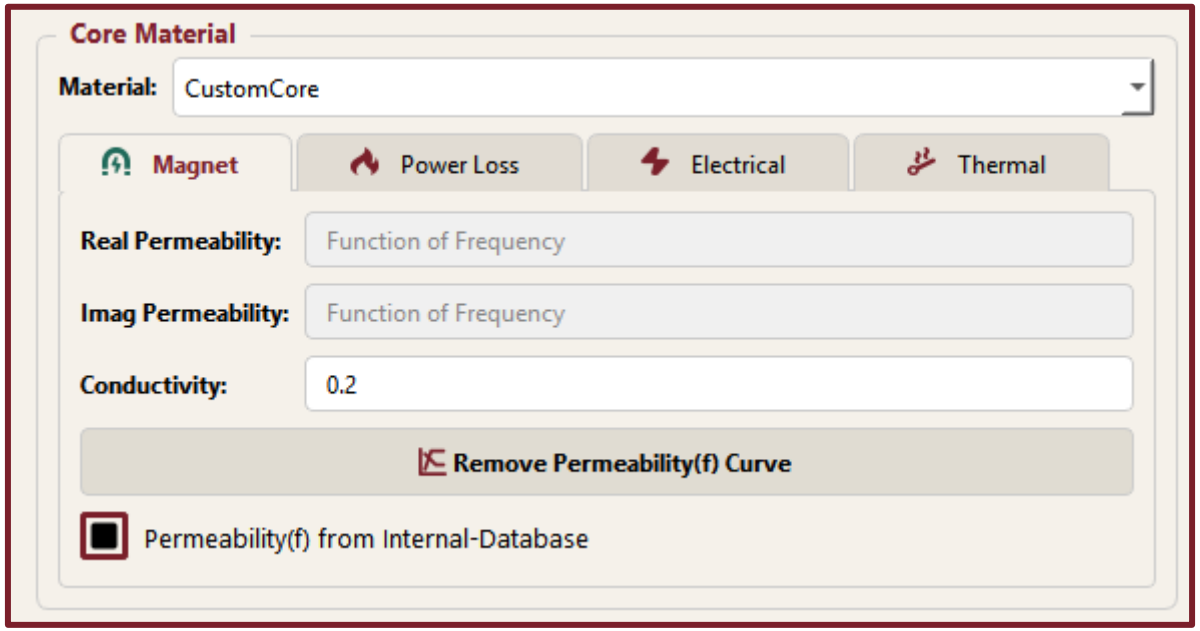


If you prefer to enter the data yourself, check the "**Add manual data**" box.
You can add rows to a table and manually type in the Frequency, Real part, and Imaginary part values to generate the fitted curve.

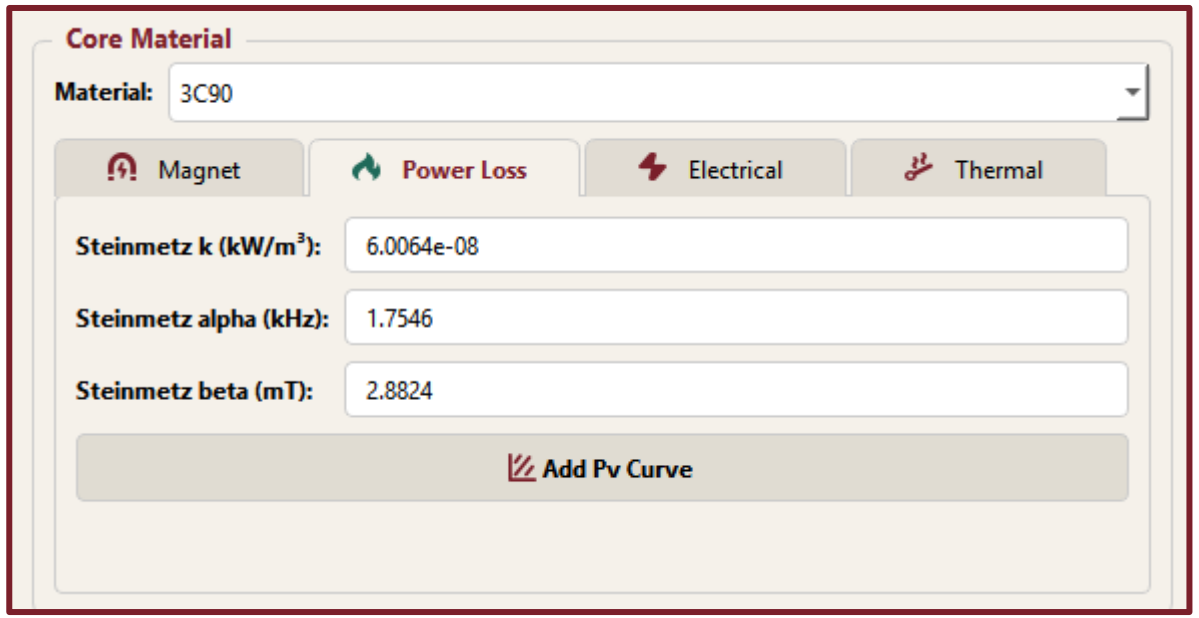


Database

Once your permeability setup is complete, your custom material (e.g., "**CustomCore**") is saved, and the "**Magnet**" tab will update to show that permeability is now a "**Function of Frequency**".



Power Loss Definition



Next, switch to the "**Power Loss**" tab to define the core's thermal dissipation.

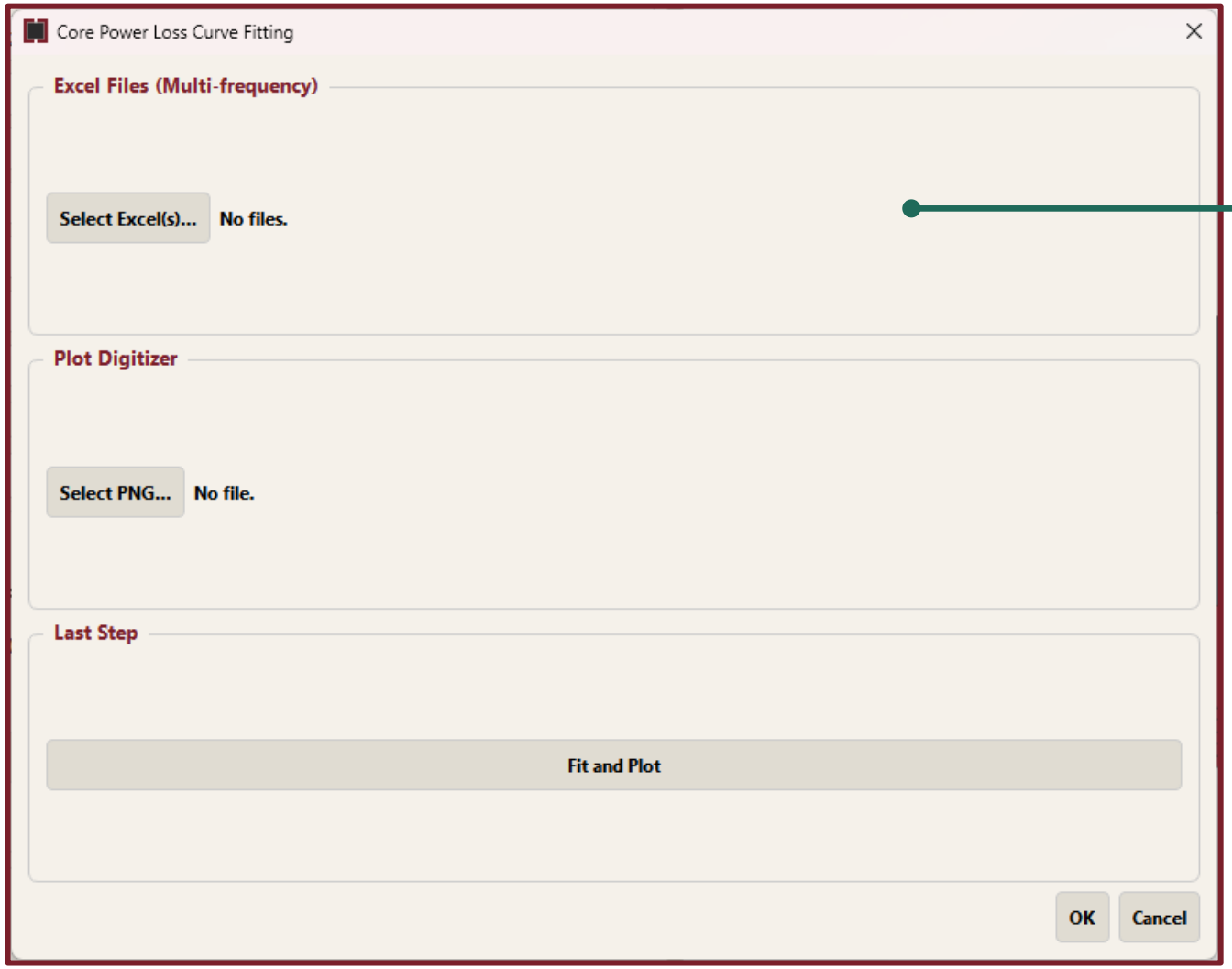
k, α & β

You can manually input the Steinmetz coefficients: k (kW/m^3), α (kHz), and β (mT).

Add Pv Curve

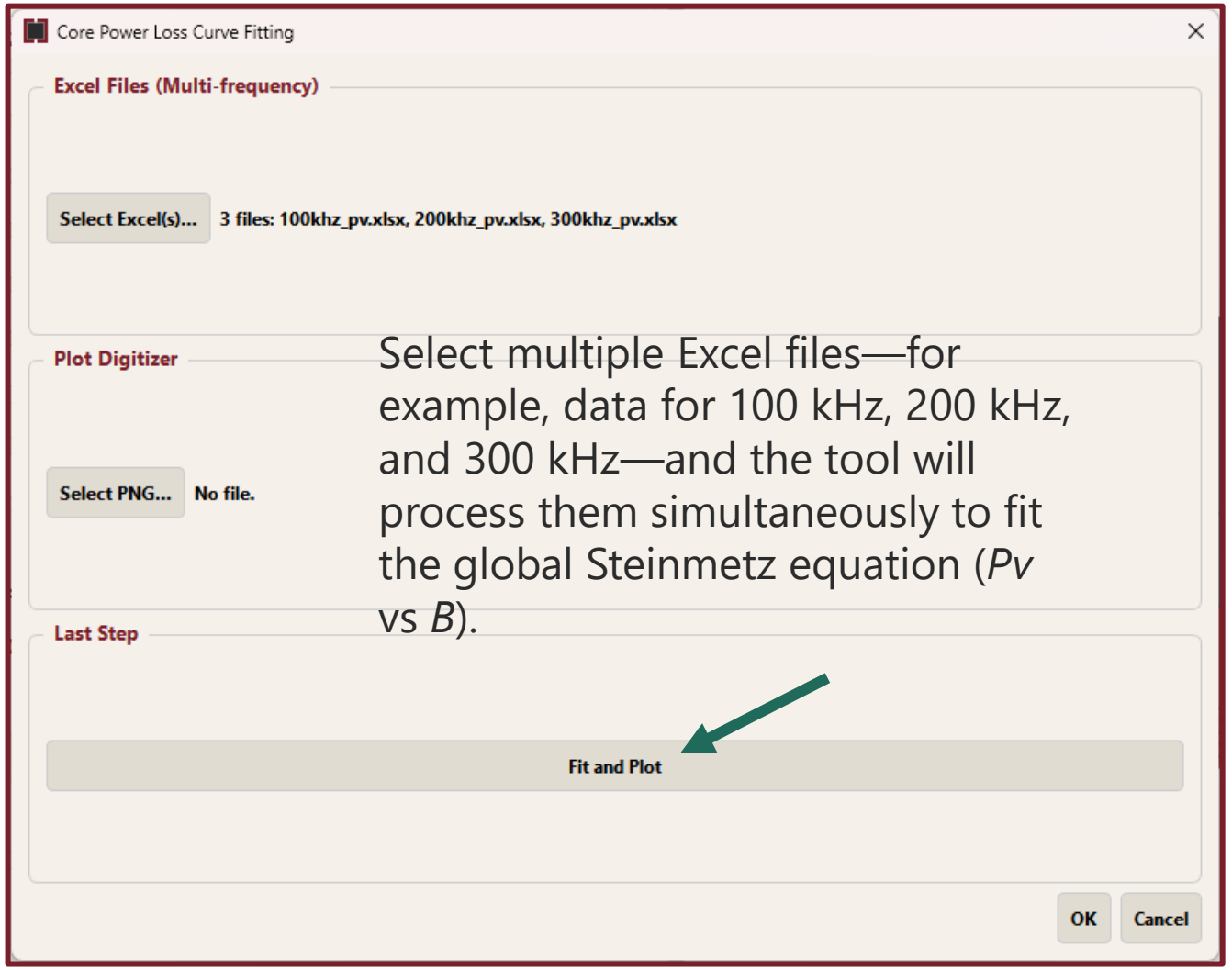
Alternatively, click the "**Add Pv Curve**" button to fit these parameters from experimental data.

Core Power Loss Curve

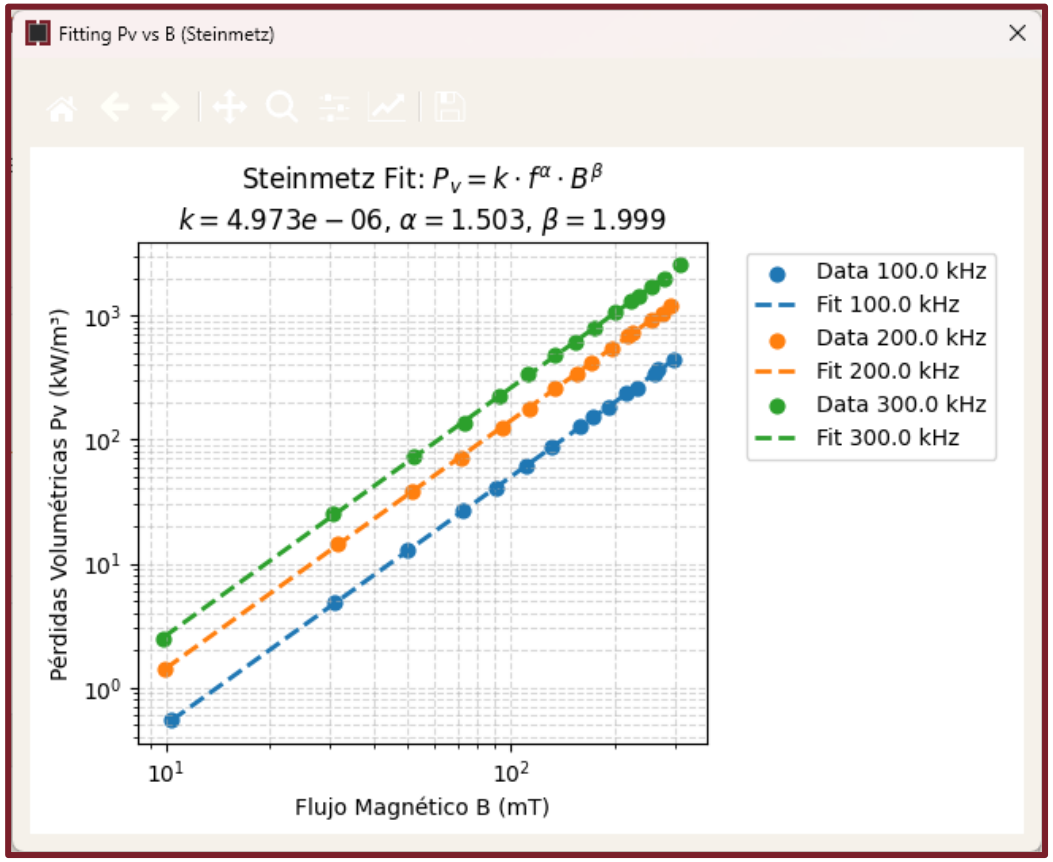


In the "**Core Power Loss Curve Fitting**" window, you can use the "Excel Files (Multi-frequency)" option.

Core Power Loss Curve – Excel Files

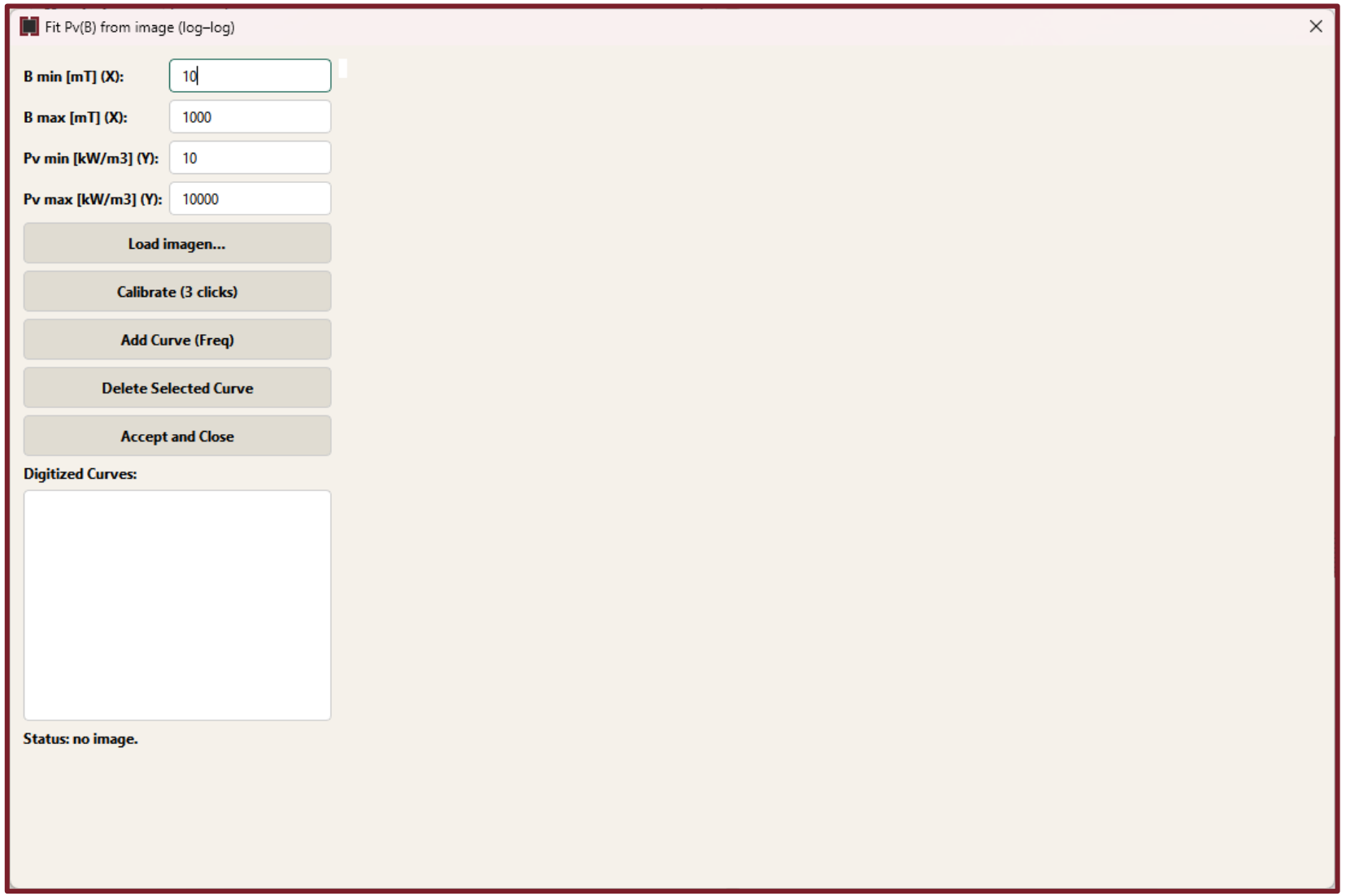


Select multiple Excel files—for example, data for 100 kHz, 200 kHz, and 300 kHz—and the tool will process them simultaneously to fit the global Steinmetz equation (*Pv* vs *B*).



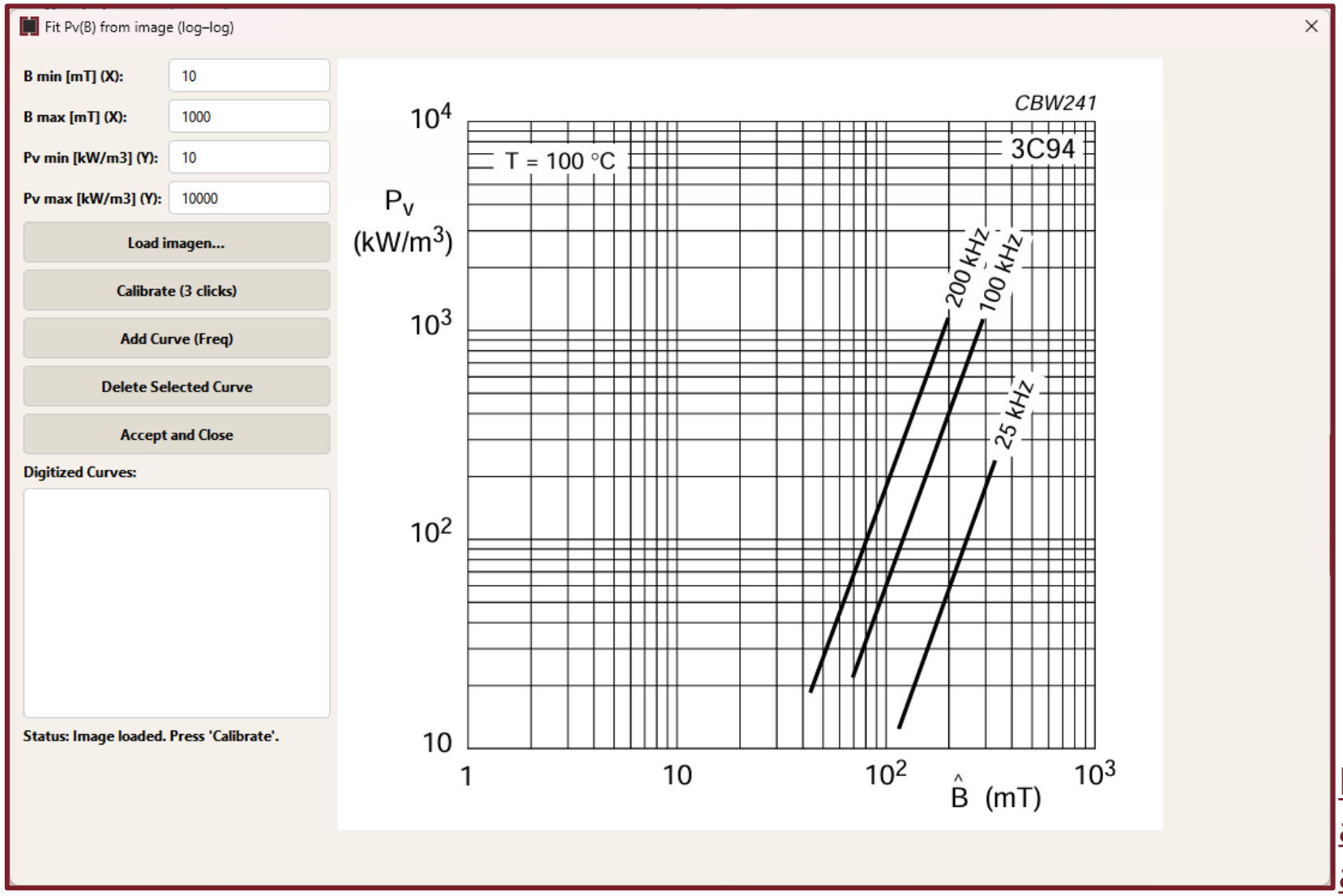
Open template in github

Core Power Loss Curve – Plot Digitizer



If you only have a datasheet image, use the **Plot Digitizer**.

Core Power Loss Curve – Plot Digitizer

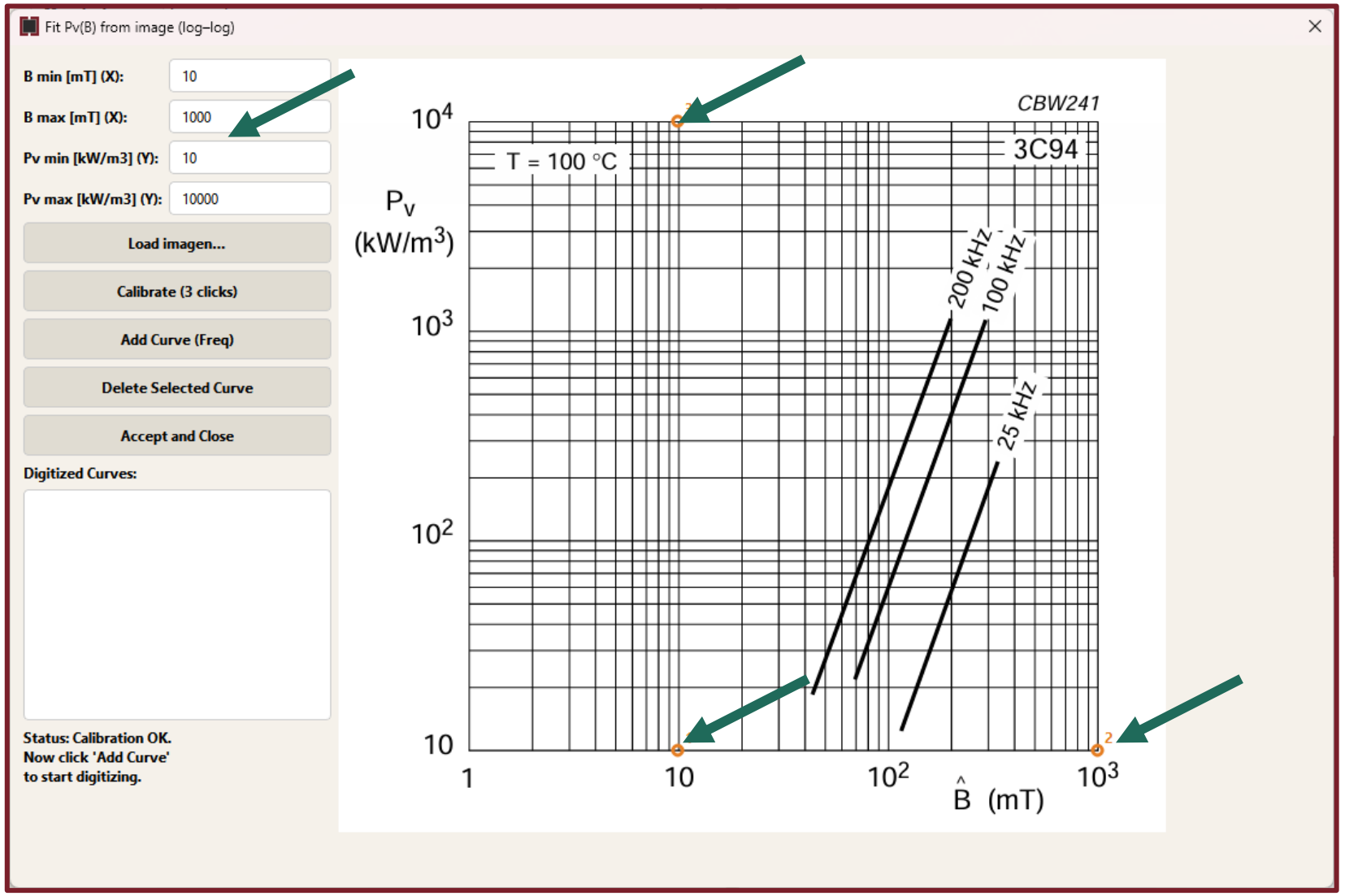


If you only have a datasheet image, use the **Plot Digitizer**.

Step 1: Click "Load imagen..." to import your log-log graph of permeability.

[MAGNETISiM/Template/Materials at main · aDelgado13/MAGNETISiM]

Core Power Loss Curve – Plot Digitizer

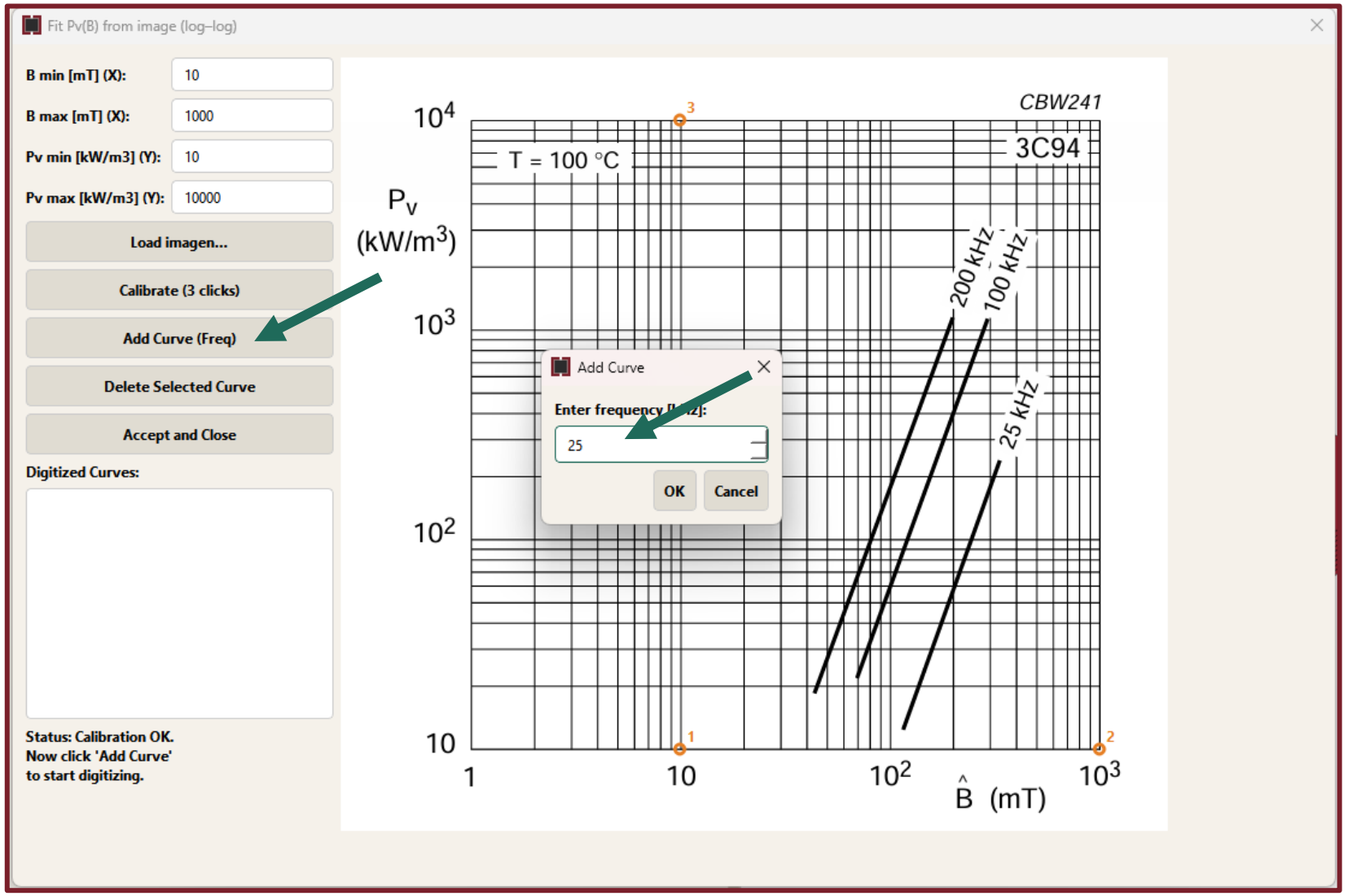


If you only have a datasheet image, use the **Plot Digitizer**.

Step 1: Click "Load imagen..." to import your log-log graph of permeability.

Step 2: Click "Calibrate" and select 3 reference points on the axes to set the scale.

Core Power Loss Curve – Plot Digitizer



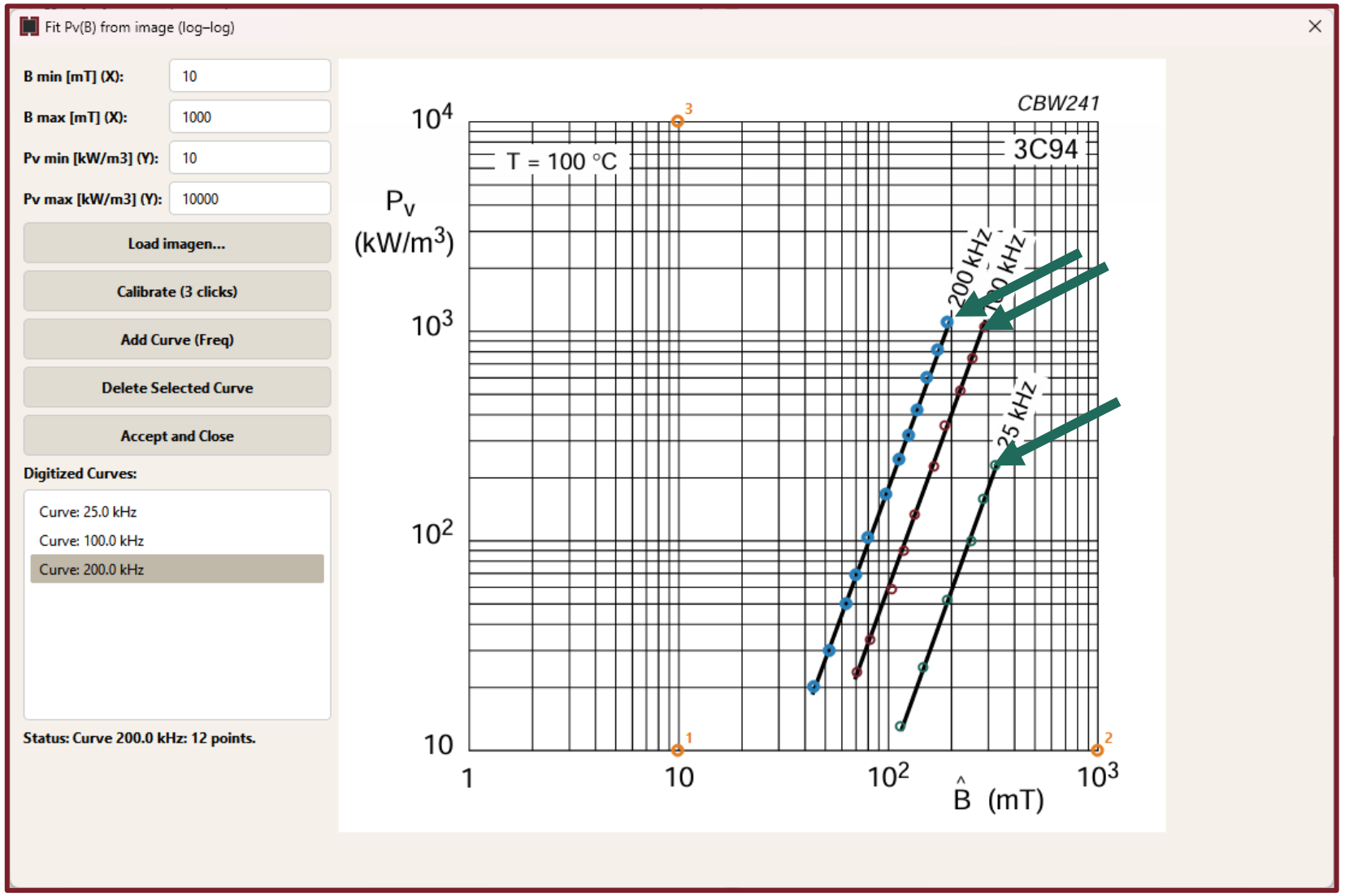
If you only have a datasheet image, use the **Plot Digitizer**.

Step 1: Click "Load imagen..." to import your log-log graph of permeability.

Step 2: Click "Calibrate" and select 3 reference points on the axes to set the scale.

Step 3: Click "Add Curve (Freq)" and enter a specific frequency (e.g., 25 kHz). Click along that specific line on the graph to digitize it.

Core Power Loss Curve – Plot Digitizer



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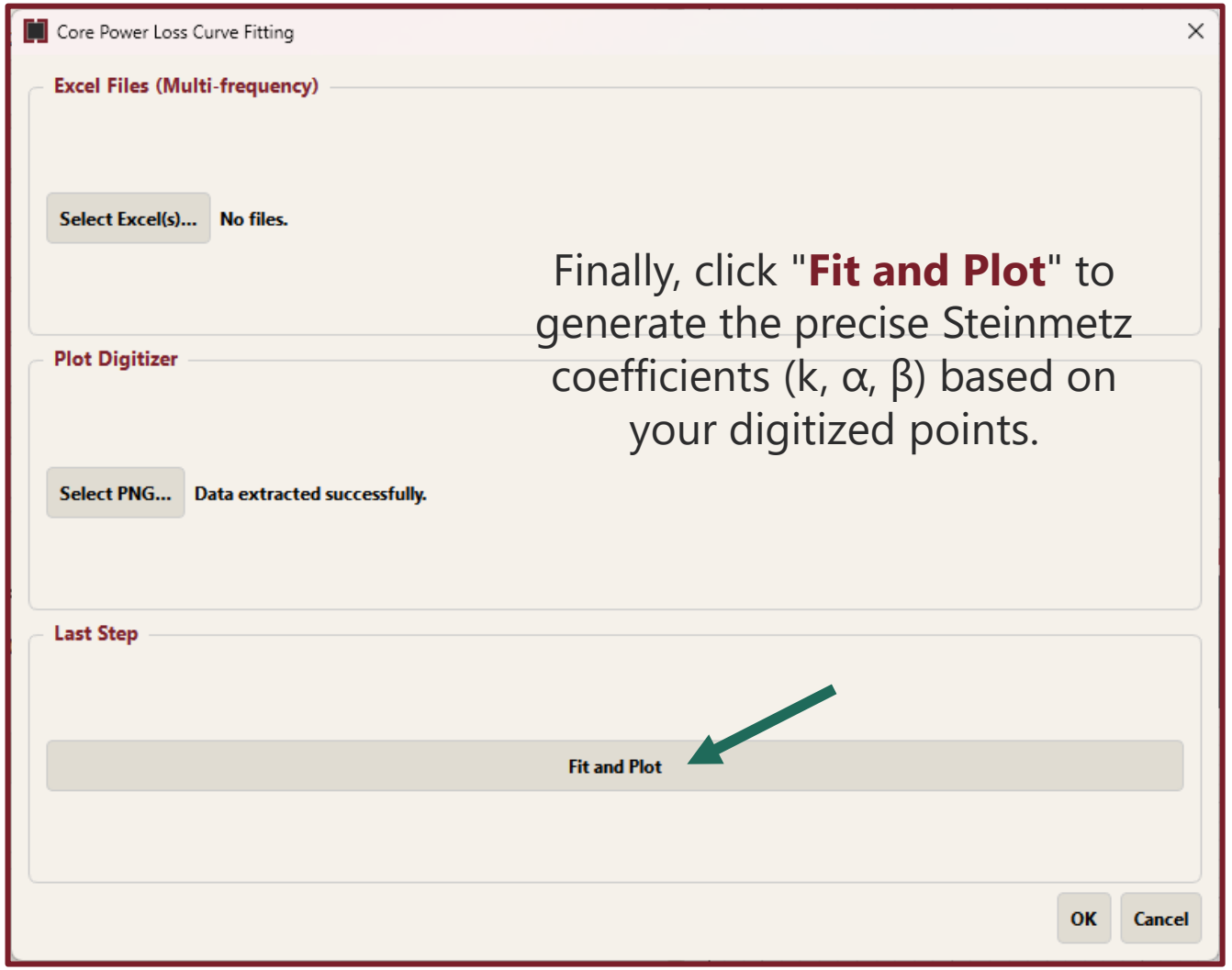
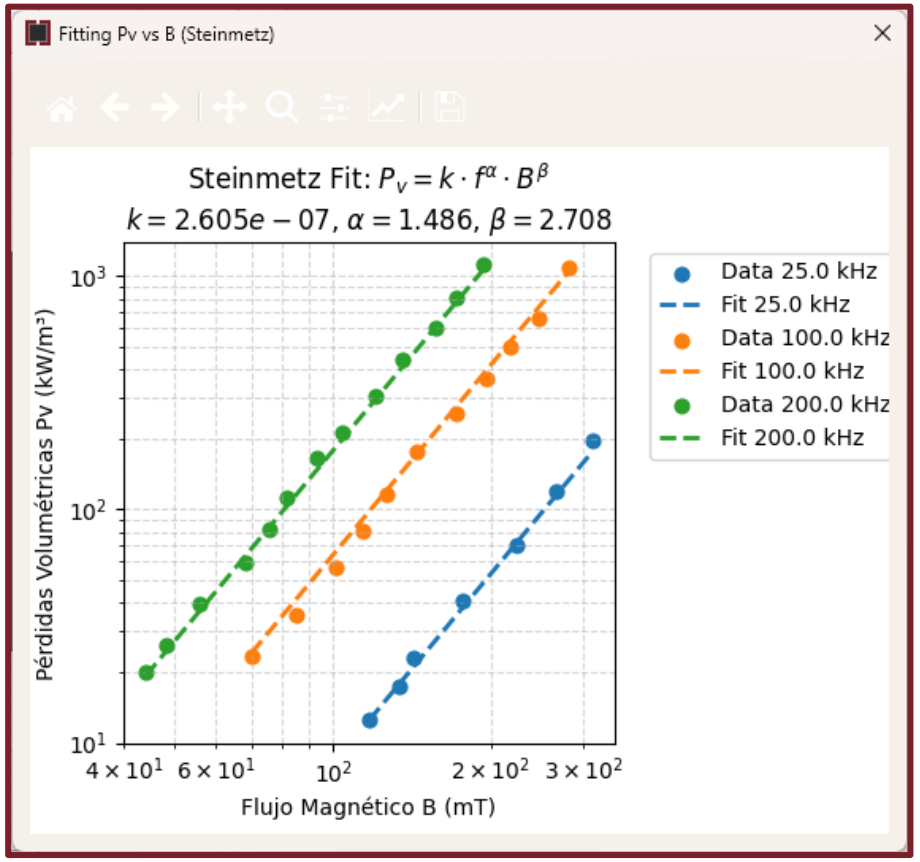
Step 4: Repeat for as many curves as you want to digitalize.

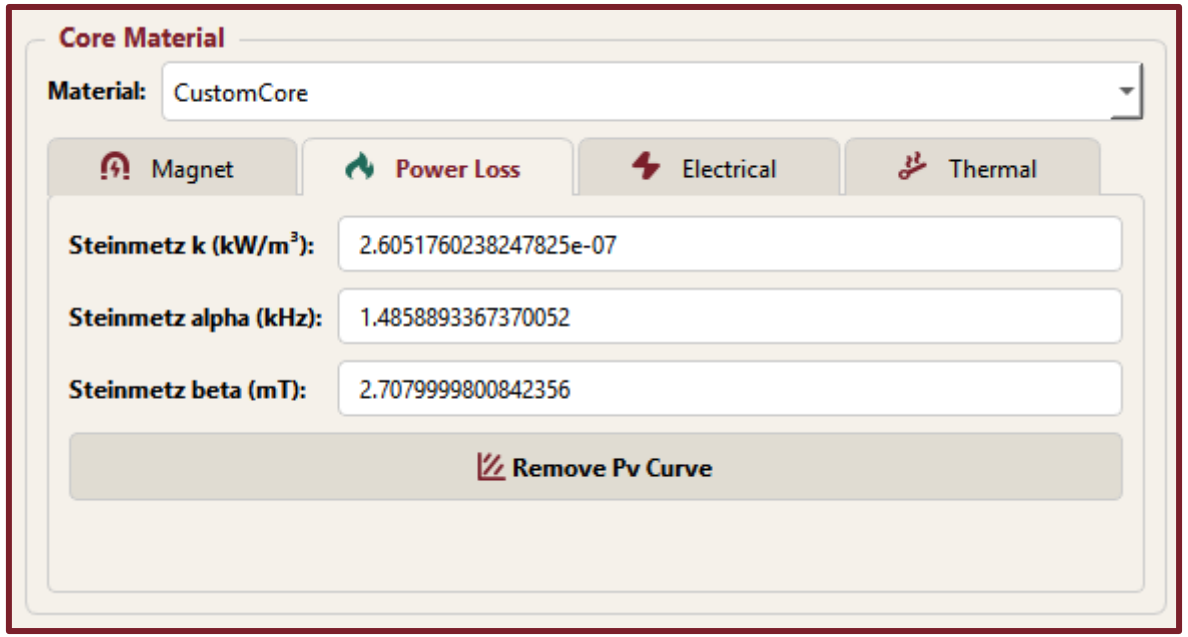
Core Power Loss Curve – Plot Digitizer



Finally, click "**Fit and Plot**" to generate the precise Steinmetz coefficients (k, α, β) based on your digitized points.

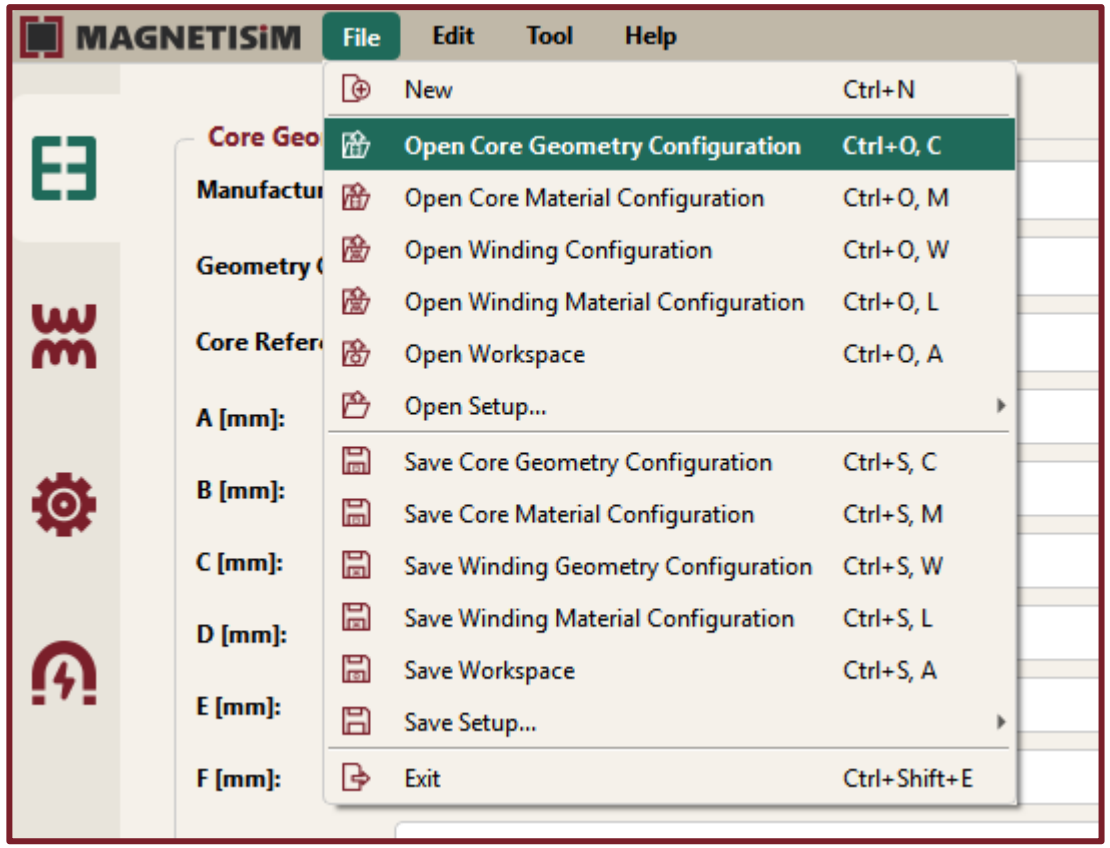


Database


Core Material
Material:
CustomCore
Magnet
Power Loss
Electrical
Thermal
Steinmetz k (kW/m³):
2.6051760238247825e-07
Steinmetz alpha (kHz):
1.4858893367370052
Steinmetz beta (mT):
2.7079999800842356
Remove Pv Curve

Magnetic Material – *.json

Behind the scenes, MAGNETISiM saves all this custom magnetic material data in a structured *.json format, capturing properties like the Debye parameters and Steinmetz coefficients. You can easily share, save, or load these configurations using the "**File**" menu (e.g., "**Save Core Material Configuration**"). You can also find material templates on the MAGNETISiM GitHub repository.




```
{
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    "muR": 2000.0,
    "muI": 0.0,
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    "FreqCurveMu": false,
    "DebyeParameter": {
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            "A": 2080.4864,
            "k": 8.1745,
            "xc": 0.2667
        },
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            "b1": 0.3215,
            "c1": 0.2308,
            "a2": 377.4976,
            "b2": 0.5864,
            "c2": 0.5162
        }
    },
    "Phi": 0,
    "Bmax": 0.38,
    "Steinmetzk": 3.5097e-07,
    "SteinmetzA": 1.5322,
    "SteinmetzB": 2.7182,
    "Steinmetz": {
        "k": 3.5097e-07,
        "alpha": 1.5322,
        "beta": 2.7182
    }
}
```


MAGNETISiM

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