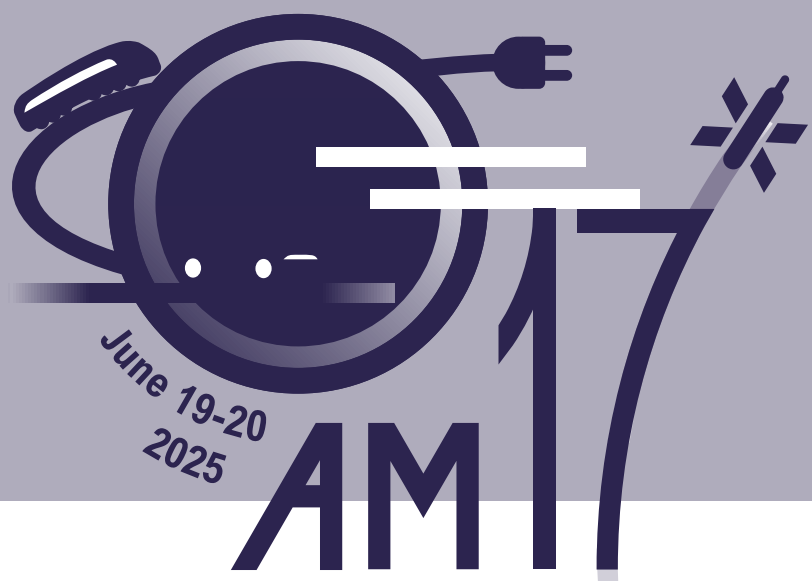




Open-Source Platform for Fast Prototyping of Planar Magnetic Components for Space Applications

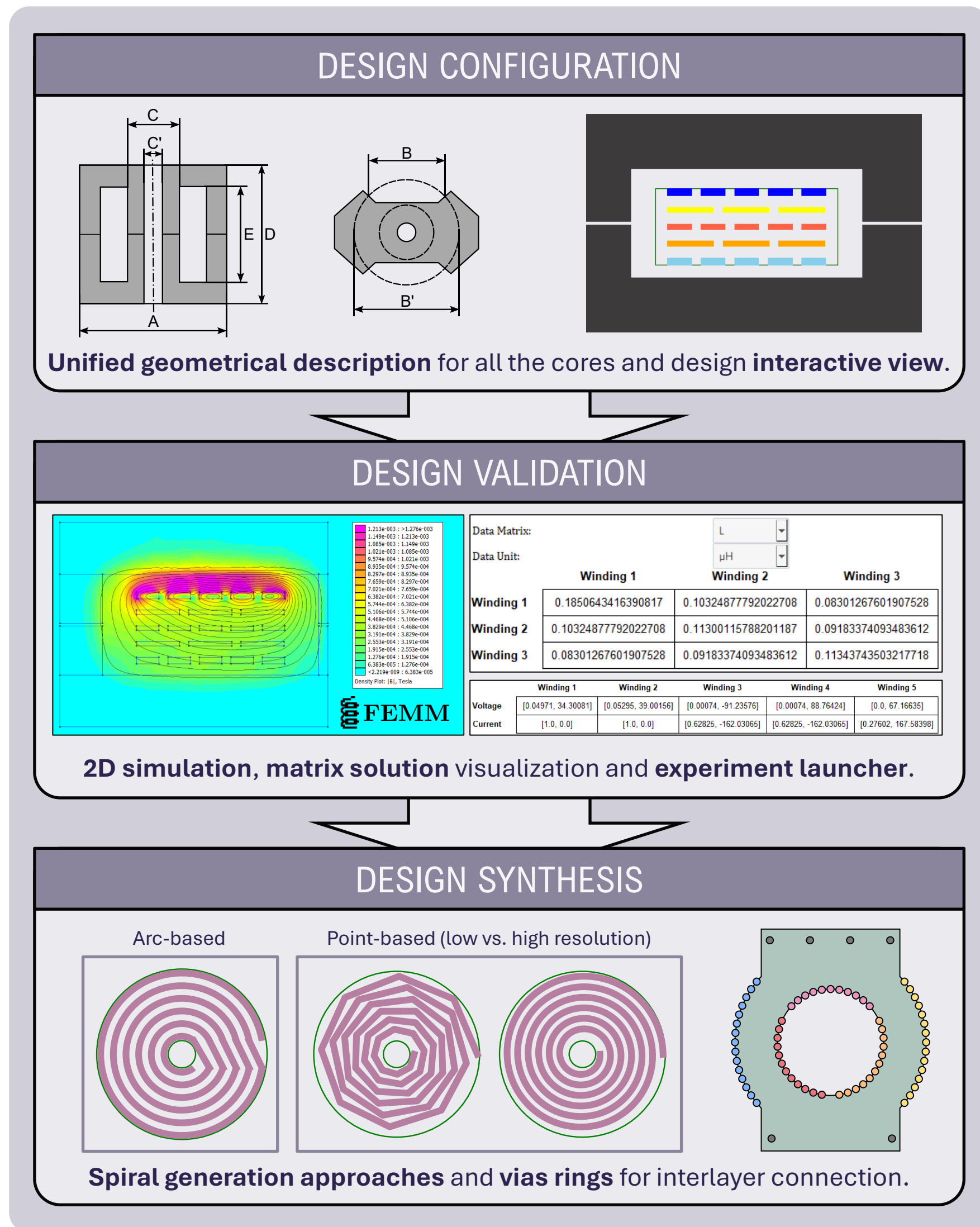
Alberto Vital Pagola

ABSTRACT

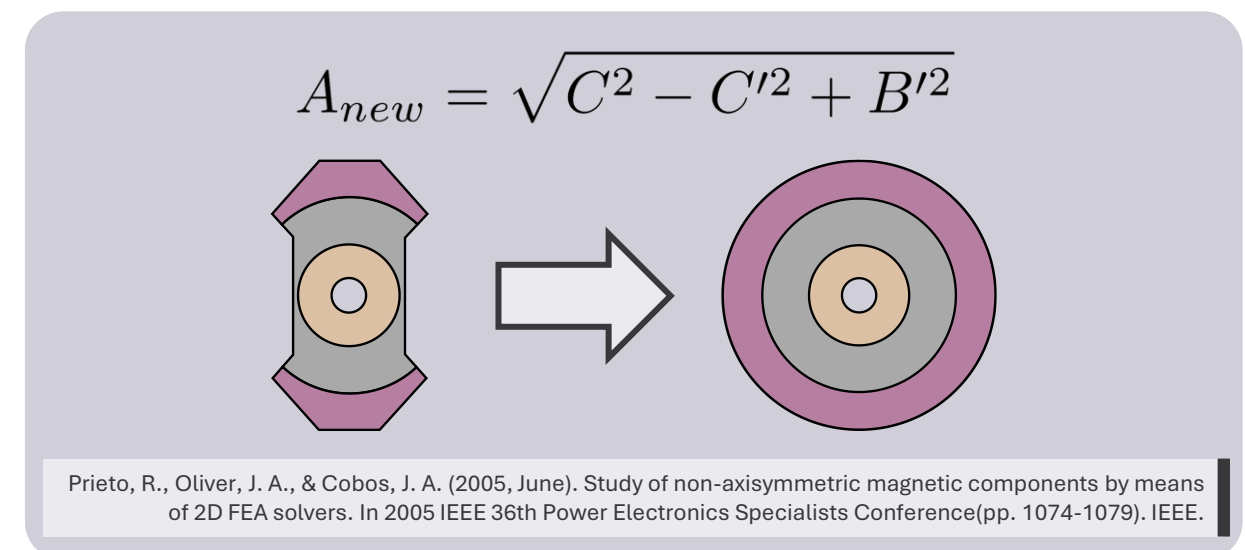
Designing **reliable magnetic components** is key for developing **robust and efficient power electronic converters** for space applications. While analytical calculations can help with preliminary designs, more advanced methods, such as **Finite Element Analysis (FEA)** tools, are necessary. This work introduces an open-source **python-based platform** designed for fast prototyping of planar magnetic components. The tool allows users to analyze electromagnetic parameters of planar inductors and transformers based on finite element results using the software FEMM®, without requiring FEA expertise. It **performs 2D simulations, models and extracts the SPICE component** using GNU Octave and a Vector Fitting algorithm and **generates PCB designs** in KiCAD EDA. All processes are carried out using **open-source software**.



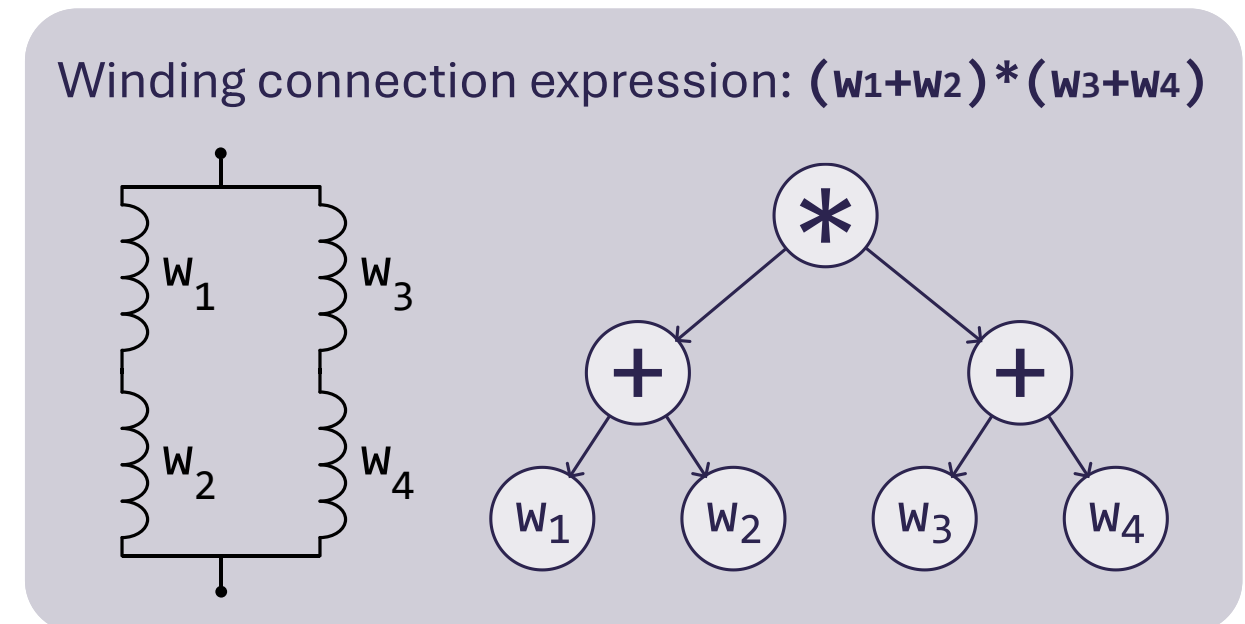
PLATFORM WORKFLOW



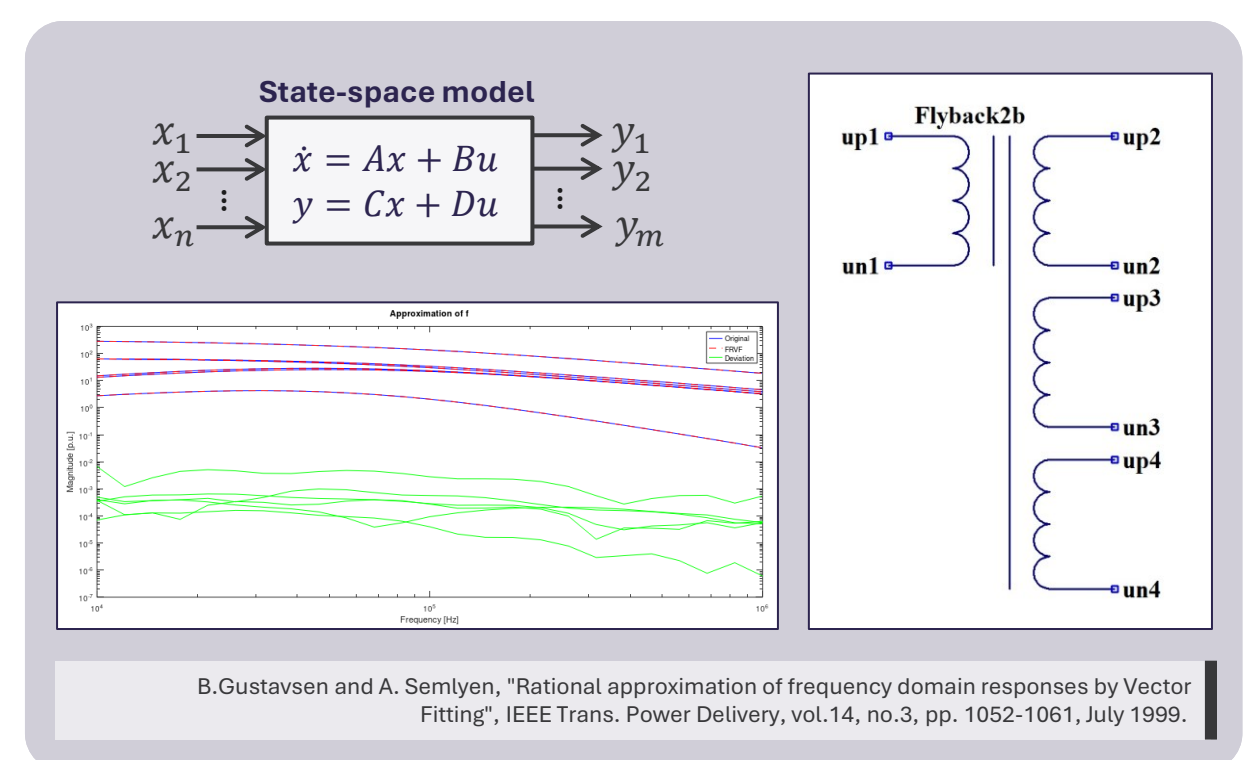
AXISYMMETRIC MODELING



WINDING CONNECTIONS



SPICE MODELING



CONCLUSIONS

This open-source tool **simplifies the design and prototyping of planar magnetic components**. It offers validation features like FEA simulations, impedance matrix visualization, and a virtual experiment launcher. Future versions will incorporate **PCB design capabilities**, all developed using **open-source software**. Results have been successfully validated using Ansys Maxwell.

FUTURE LINES OF RESEARCH

- Inclusion of **non-radial core geometries** (XY geometries).
- **Thermal analysis**.
- **Parasitics** modeling, including capacitances.
- **PCB design optimization** (including vias and extra layers).
- Design optimization via **Artificial Neural Networks (ANN)**.
- **Export formats** and reports.