

InCa3D®

Advanced Interconnections Simulation

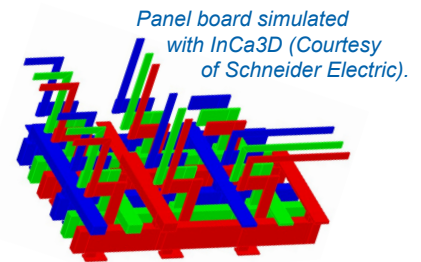
By providing this state-of-the-art simulation tool that makes the modelling and optimisation of connections much easier, CEDRAT Group opens up the horizons of electrical design engineers. InCa3D is the most complete simulation tool dedicated to the modelling of electric connections for power electronics and power engineering applications. InCa3D is suitable for almost all kinds of conductors:

- Small connections: ICs, wire bondings,
- Busbars,
- Complex structures: internal connections of power modules,
- Very large connectors: electric distribution bars ...

Fast and easy simulation

Based on the PEEC (Partial Element Equivalent Circuit) method, which avoids the cumbersome meshing of the air, InCa3D:

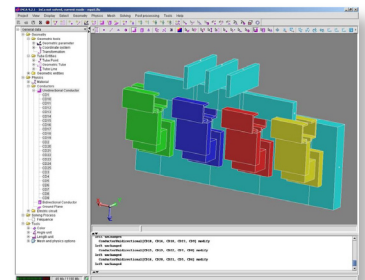
- models easily complex 3D conductors by an R,L,M equivalent circuit,
- is very fast: computation time reduced from one week with traditional FEM software to four minutes with InCa3D on a panel board.



Convenient GUI and command language

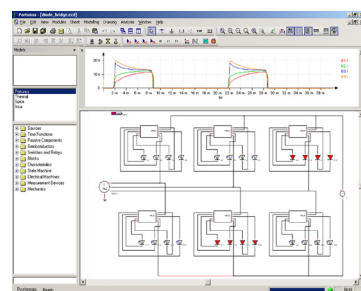
InCa3D is user friendly thanks to its Windows Graphical User Interface used from pre- to postprocessing. Besides, InCa3D command language is based on an open source and well known programming language (Python) that makes it possible for the user to program his own advanced user commands and macros.

Advanced InCa3D GUI for easy handling



Export to system simulator

Want to include conductors' electric model into your system simulations?



InCa3D provides exports to both Saber and Portunus, the novel system simulator. With a complete and accurate transient or harmonic analysis of the electric system, Portunus and InCa3D provide complete simulation results to designers.

Complete simulation of this diode bridge achieved thanks to InCa3D's link to Portunus.

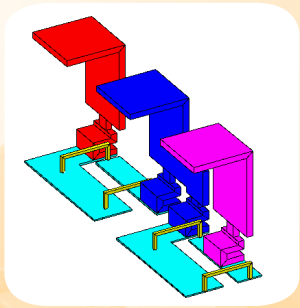
WEB LINKS

Power Module

Busbar design

Busbar copper losses computation

Electric distribution bars



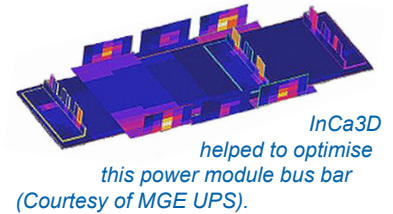
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Extended results

A complete overview of the connections' electric behaviour is available through two solving options:

- **Impedance computation:** impedance matrix, export files to circuit simulators (Portunus, Saber) for more complete time and frequency domain simulations (current and voltage waveforms).
- **Current computation:** current in components, current distribution in the connectors and other related results: global values, isovalues and curves of current, losses, Laplace forces and magnetic flux density.



WEB LINKS

Modelling of complex 3D conductors

Quasi instantaneous results

Characterization of proximity and frequency effects

Ground plane effects

Time and frequency domain analysis

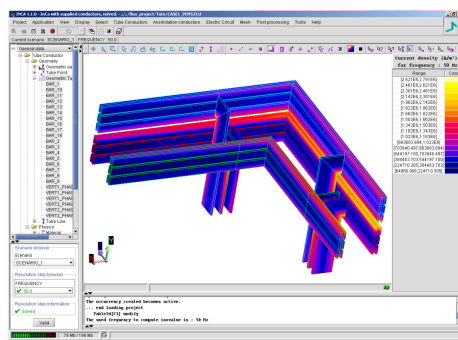
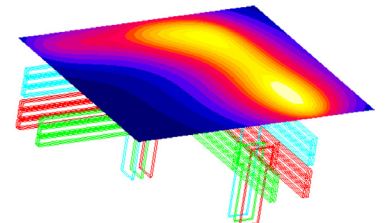
Coupling to CFD

Thanks to the integrated postprocessor, one solving is sufficient to get a complete range of results.

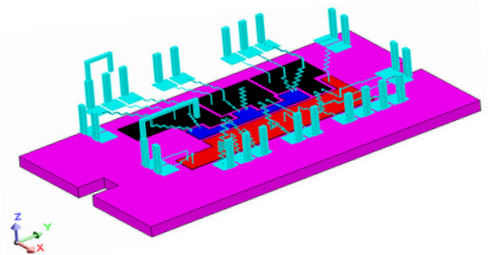
Examples of use

The PEEC method was initially developed for PCB (Printed Circuit Board) applications but it proved to be efficient for any kind of electrical distribution system. Particularly well adapted for power electronic applications, **InCa3D** is appropriated for power engineering systems as well:

- **Power electronics applications:** Loop inductance, over voltage during commutations, EMC, ...
- **Power engineering applications:** Losses, performances (thermal, mechanical), ...



Fast computation for very large connectors like these distribution bars.



InCa3D is co-developed by CEDRAT and G2E lab, Grenoble, France.
InCa3D is a registered trademark of CEDRAT.



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