

ELEKTRA

3D TIME VARYING EM ANALYSIS

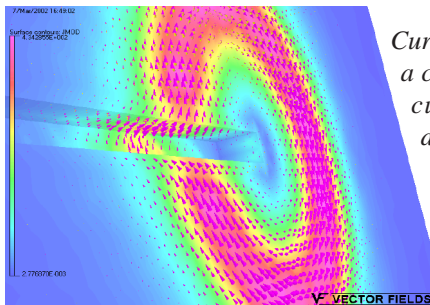
The ELEKTRA analysis package is a module of the OPERA-3d integrated suite of finite element software for 3D electromagnetic design analysis and simulation. ELEKTRA computes time varying fields, both time harmonic and transient in three dimensions and is well proven over many years of industrial use.

Concepts

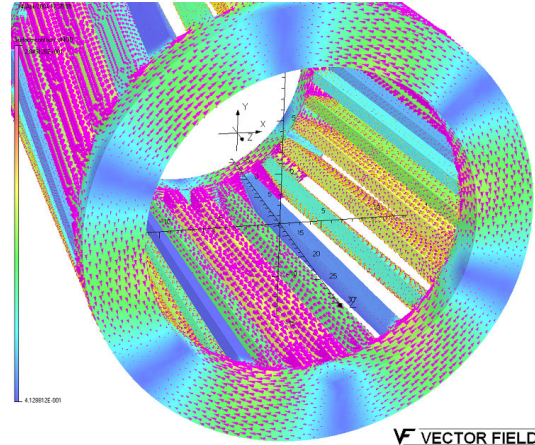
In optimizing the design of electrical equipment the basic electromagnetic conceptual design needs to be based on proven analysis tools. As a specialist in electromagnetic design VECTOR FIELDS has built up an enviable reputation over many years for reliable, accurate and easy to use software for the electrical engineer.

The complex computation of time varying fields has been extensively researched by the VECTOR FIELDS research team and the ELEKTRA package with the OPERA-3d Modeler and Post-Processor package offers a complete environment for this class of electromagnetic analysis and design.

With the latest VECTOR FIELDS developments the analysis of electromagnetic fields has moved from the realms of specialist analyst to the main stream design process. Interfaces to major CAD packages enables the ELEKTRA software to be integrated into an overall computer aided engineering system.



Current flowing around a crack is used in eddy current NDT (non destructive testing) of conducting samples



Eddy currents in skewed induction motor cage, taking into account non-linear magnetic materials

Applications

VECTOR FIELDS outstanding experience in the 3D computation of time varying fields is internationally recognised. Consequently ELEKTRA is used extensively for this demanding application by leading manufacturers, research laboratories and universities. The experience of the VECTOR FIELDS development team and application engineers has produced a package that is easy to use for the design of a wide range of equipment including the following:

- NDT equipment
- MRI systems
- Eddy current heaters
- Electrical machines
- Recording heads
- Electron lenses
- Particle accelerators
- Fusion magnets
- Electromagnetic shielding

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Software for Electromagnetic Design

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Method

ELEKTRA uses specialist finite element analysis techniques for time varying electromagnetic fields. The time variation can be time harmonic (steady state AC) or transient. In addition the effects due to high speed motion can be computed. The **ELEKTRA** method uses total and reduced vector potentials thereby correcting the cancellation errors associated with a single potential approach, and reducing the computation time. To enable the effects of high speed motion to be modeled **ELEKTRA** uses a numerical technique known as 'upwinding'.

The magnetic material properties for **ELEKTRA** may be specified as linear or non-linear. The ability to model nonlinear materials under a.c. excitation is an important feature. The permeability is calculated using the magnitude of the field at any point giving a representation of saturation effects in ferromagnetic materials. A hysteresis model is also included so that materials which exhibit a phase shift between **B** and **H** can be modeled. This allows the computation of losses associated with hysteretic materials in the design of electrical machines, transformers and a.c. actuators.

Features

ELEKTRA has the following features:

- Full 3D modeling
- Efficient Data Input
- Time harmonic field analysis
- Transient field analysis
- High speed motion analysis
- Non linear materials
- Complex permeability
- Hysteresis effects
- Interfaces to CAD/CAM
- Extendible Post-Processing
- Adaptive time stepping

Modeler and Post-Processing

As a module of the OPERA-3d suite of software, **ELEKTRA** interfaces to the OPERA-3d Modeler and Post-Processor. This gives the user access to powerful pre and post-processing features specifically tailored for electromagnetic design including an advanced Graphical User Interface (GUI) with an easy to use menu system for data input and

display of analysis results. Interfaces to industry standard CAD packages are also available.

The Modeler assists the user to create a 3D model of the device to be analyzed, quickly and efficiently. Material data can be selected from a library of characteristics or input from the users own data. The resulting input is fed directly to the **ELEKTRA** analysis module.

The Post-Processor gives the user facilities to display the results of the analysis in a number of ways including:

- 3D model views for any angle
- Graphs, histograms and contour maps of the solution
- Contours of the results on any surface
- Calculation of fields, forces and energy
- User defined functions

Hardware

All Vector Fields software runs on PCs and Workstations. It is Vector Fields policy to always support the latest operating system on each hardware. A list of supported hardware, and suggested minimum configurations, is available on request.

Customer Support

Applications advice and "hot-line" support is an integral part of the Vector Fields service. Professional engineers with extensive electrical design experience are available to help users in their application of **ELEKTRA**. Your main Vector Fields office or local distributor will be pleased to be of assistance at all times.

Comprehensive user documentation is provided with **ELEKTRA** enabling new users to quickly apply the software to their application. In addition, training courses are held regularly to give "hands-on" training in the use of **ELEKTRA**.

User group meetings are held annually giving users the opportunity to discuss their applications with Vector Fields experts and other users in a relaxed atmosphere.

Whatever your application and wherever you are located, you can be sure of Vector Fields interest and support.

VFI-07-05-E1

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