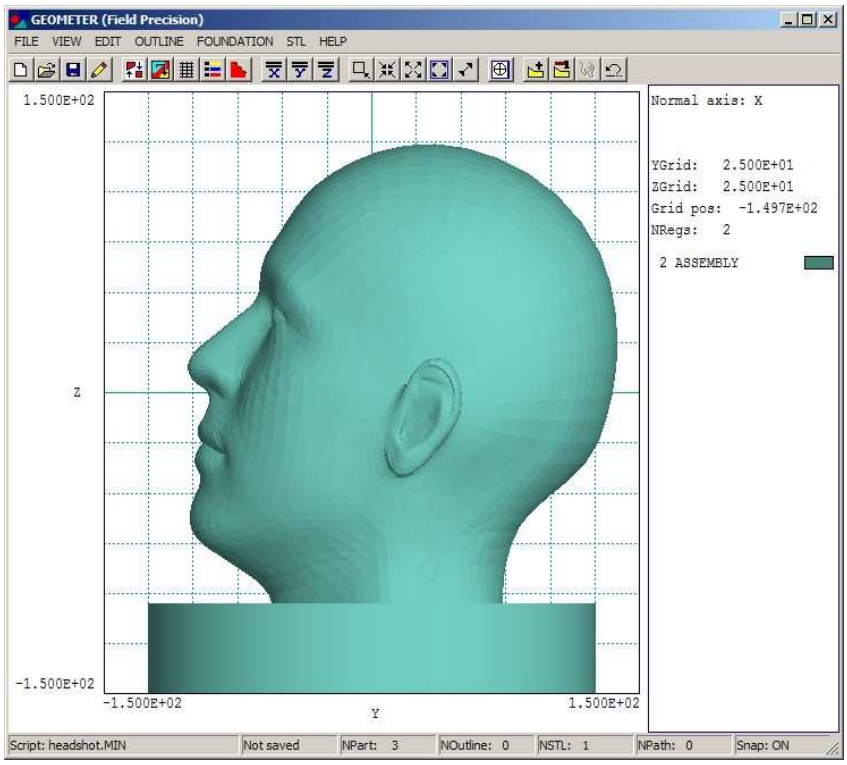
Field Precision Catalog

Finite-element Software for Electromagnetics

Field Precision LLC
PO Box 13595, Albuquerque, NM 87192 U.S.A.
Telephone: +1-505-220-3975
Fax: +1-617-752-9077
E mail: techinfo@fieldp.com
Internet: http://www.fieldp.com

Contents



Introduction

Welcome to Field Precision LLC. Since 1989, we have created technical software at the forefront of engineering and physics. Programs run on personal computers under any version of Windows^{TM}. This catalog introduces our product line and is designed to help you decide whether finite-element software is the right tool for your application.

Why is Field Precision software unique?

At Field Precision, technical decisions always outweigh marketing decisions. Our programs are characterized by an absence of code bloat and spurious features. Each line of code is crafted for minimum setup time, maximum run speed and the effective display of scientific information.

- **Fast and efficient**. Programs are carefully coded for peak efficiency. With our unique structured mesh technology, you can solve 3D problems in minutes.
- **Affordable**. Prices fit the budgets of small companies, consultants and universities.

- **Easy to learn**. Packages include full-featured graphical-user interfaces, libraries of ready-to-run examples and textbook-quality instruction manuals.

- **Accuracy and advanced capabilities**. Our programs constitute the most powerful technical software available on any platform for charged-particle devices, radiation transport, and a broad range of other applications.

What is the function of finite-element software?

Finite-element programs calculate quantities that vary over a region of space (*fields*) – examples include electric fields, magnetic fields and temperature distributions. These quantities are governed by partial differential equations. You can solve the equations analytically for simple systems, but numerical methods are more effective for real-world geometries or when materials exhibit complex behavior. For a solution on a digital computer, the differential equations must be converted to a large set of linear equations. The strategy is to divide space into small pieces (*elements*) so that field variations over a single piece are relatively simple. This activity is called *mesh generation*. The finite-element method is one way to generate the linear-equation set. In contrast to finite-difference methods, the finite-element procedure can handle *conformal meshes* where elements closely fit the boundaries of objects. The resulting advantage is higher accuracy with fewer operations.

Numerical computer codes are powerful tools. In a few hours, you can find solutions for complex systems that would require weeks of effort by mathematicians or theoretical physicists. Nonetheless, it is important to remember that numerical calculations have their own challenges. The efficiency of solutions and the quality of results depend on your judgment. To help, we have put considerable effort into documentation and user interfaces. Experienced researchers can add numerical methods to their capabilities with a few days effort.

What calculations do Field Precision programs perform?

We concentrate on finite-element tools for electromagnetic calculations rather than mechanics. Our products can be divided into the following classes:

- Electric and magnetic fields in different frequency regimes (from static to microwave and optical frequencies).

- Charged particle trajectories, electron and ion gun design.

- Thermal transport in solids and tissue, with the option for coupled field solutions (*e.g.*, RF electric field heating, inductive heating).
- Transport of electrons, photons and positrons in matter with the option for coupled thermal and beam calculations (*e.g.*, X-ray imaging and sources).

Catalog organization

Our software packages cover a wide spectrum of applications in physics and engineering, and this catalog is necessarily extensive. It is divided into the following sections:

- **E&M Toolkits** (page 8) are combinations of 2D programs that address common applications involving electric and magnetic fields. The programs handle planar geometries (variations in x and y, infinite length in z) or cylindrical systems (θ symmetric)
- **Advanced E&M Design Suites** (page 13) include both 2D (**TriComp**) and 3D (**AMaze**) programs for applications involving electric and magnetic fields. The 2D software is effective for quick approximations while the 3D programs yield high accuracy.
- **Advanced Application Packages** are self-contained packages for specialized applications. Selections include **GamBet** (Monte Carlo simulaton of electron/photon/positron transport in matter page 17) and **Xenos** (design of X-ray sources and imaging systems, page 19).
- The section **TriComp Program Data Sheets** (page 22) gives details on individual component 2D programs of the standard packages. The section **AMaze Program Data Sheets** describes 3D component programs. We can assemble custom packages of component to meet your applications.

How to get more information and request a trial

Our guiding sales principle is complete transparency. There are no surprises or disappointments when you purchase our software. All instruction manuals are available for download from our Technical Library at:

`http://www.fieldp.com/library/library.html`

You can decide for yourself whether a program fits your application or work style by arranging a free 30-day trial of any software package. Send a request to `techinfo@fieldp.com` and we will set up an immediate electronic download. (Note: please contact us through your organizational E mail system. We cannot send trial software to individuals with generic E mail addresses.)

How to order software

Current prices are listed at

`http://www.fieldp.com/order.html`

To order by credit card, contact us by telephone (`+1-505-220-3975`) or print out the **Order Form** on page 43 and send it by FAX (`+1-617-752-9077`) or mail (Field Precision, PO Box 13595, Albuquerque, New Mexico 87192 U.S.A.). Please contact us at `techinfo@fieldp.com` for information on custom packages, educational discounts and site licenses. Recognized organizations may send a purchase order by FAX or mail. Please include a billing address and an E mail address so we can confirm the order.

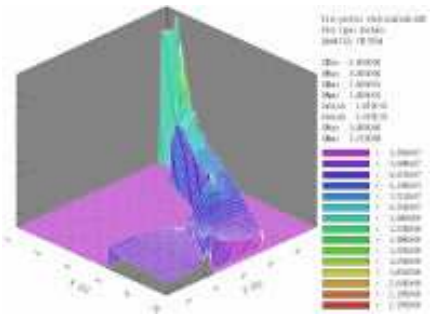
Orders are fulfilled within one day via electronic download. There is no handling or setup charge. We can also send a CD by mail for a shipping charge of $50.00. If you decide within 30 days that the software does not meet your application, notify us and we will issue a credit or cancel the purchase order. Payment for non-credit-card orders should be made within 30 days of receipt by a wire transfer or a check drawn on a U.S. bank.

E&M Field Solution Toolkits

Inexpensive 2D toolkits handle systems with cylindrical or planar symmetry. All packages include **Mesh** (universal 2D mesh generator) at no charge.

Electrostatics Toolkit

Description: Electric field calculations for applications such as high-voltage design and capacitance evaluation. Regions may represent electrodes, dielectrics, conductors or space-charge. Advanced features include non-linear dielectrics and arbitrary spatial variations of conductivity and space-charge density.

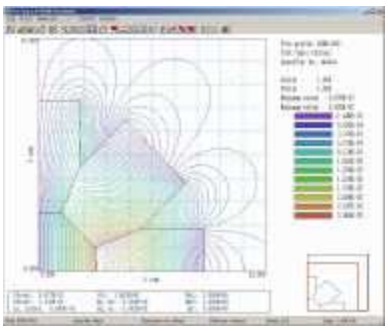


Part number: TK0100.

Component information: **Mesh** 6.0 (page 23) and **EStat** 6.0 (page 24).

Magnetic Design Toolkit

Description: Versatile programs address the full range of magnetostatic calculations. The package handles permanent magnets with non-linear demagnetization curves, saturation effects in magnetic materials, coils of arbitrary shape and anisotropic materials.

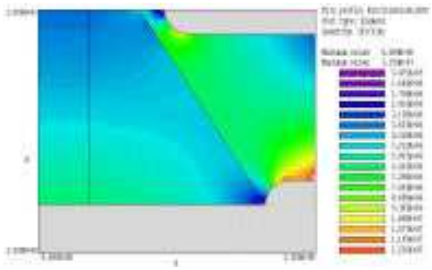


Part number: TK0200.

Component information: **Mesh** 6.0 (page 23) and **PerMag** 6.0 (page 25).

Static Field Analysis Toolkit

Description: Comprehensive package for electrostatics and magnetostatics. Regions in electric field solutions may represent electrodes, dielectrics, conductors or space-charge. Magnetic field program handles coils, permanent magnets and non-linear magnetic materials.

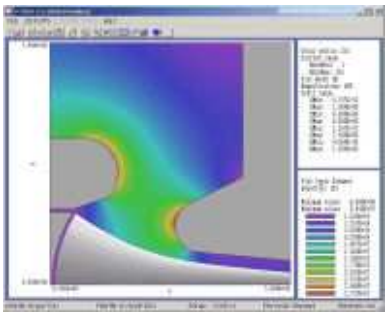


Part number: TK0300.

Component information: **Mesh** 6.0 (page 23), **EStat** 6.0 (page 24) and **PerMag** 6.0 (page 25).

Trak Charged Particle Toolkit

Description: **Trak** has become a world standard for electron/ion gun design and simulations of charged-particle devices. Integrated software suite for calculating electric/magnetic fields and modeling charged-particle guns and transport systems.

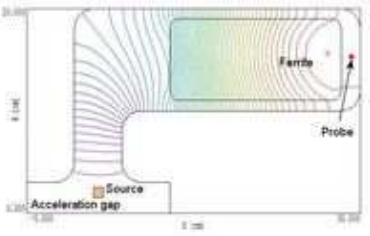


Part number: TK0400.

Component information: **Mesh** 6.0 (page 23), **EStat** 6.0 (page 24), **PerMag** 6.0 (page 25) and **Trak** 7.0 (page 26).

Electromagnetics Toolkit

Description: Comprehensive package for frequency- and time-domain electromagnetic simulations. **WaveSim** simulates both closed and open systems with the option for material losses. **EMP** tracks any user-specified electromagnetic pulses through complex geometries. Applications include resonator design, electromagnetic scattering, EM interference and pulsed-power devices.

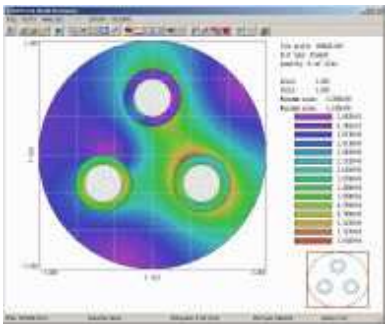


Part number: TK0500.

Component information: **Mesh** 6.0 (page 23), **WaveSim** 6.0 (page 28) and **EMP** (page 27).

Universal EField Toolkit

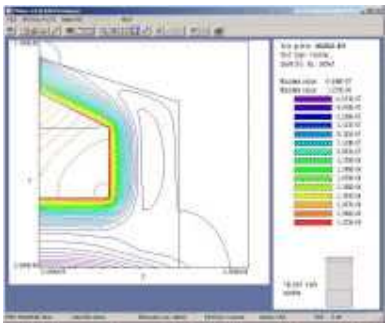
Description: Calculation of electric fields across the full frequency spectrum. **EStat** covers dielectric or conductive solutions in complex material assemblies. **RFE2** calculates AC/RF fields created by electrodes in lossy dielectrics with combined effects of real and displacement currents.



Part number: TK0600.

Component information: **Mesh** 6.0 (page 23), **EStat** 6.0 (page 24) and **RFE2** (page 31).

Universal BField Toolkit

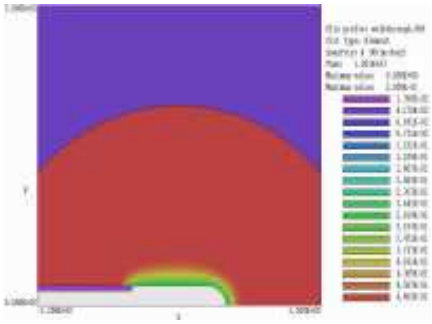


Description: This package handles the full frequency range of magnetic field solutions including permanent magnets, AC/RF fields with eddy currents and pulsed field assemblies with conductive materials. Includes both frequency- and time-domain solvers.

Part number: TK0700.

Component information: **Mesh** 6.0 (page 23), **PerMag** 6.0 (page 25), **Nelson** 6.0 (page 32) and **Pulse** (page 30).

RF Heating Toolkit



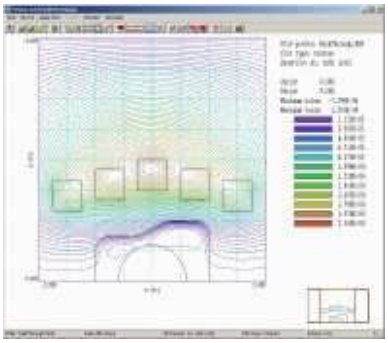
Description: Unitized package to calculate RF electric field distributions and resultant heating in materials. Applications include material processing, biomedical procedures and hyperthermia research. **RFE2** determines RF electric fields generated by electrodes in conductive dielectric materials while **TDiff** calculates the resulting heating effects. Advanced features include thermal radiation boundaries and blood perfusion contributions.

Part number: TK0800.

Component information: **Mesh** 6.0 (page 23), **RFE2** 6.0 (page 31) and **TDiff** (page 29).

Induction Heating Toolkit

Description: Coupled magnetodynamic and thermal calculations. **Nelson** finds self-consistent AC/RF magnetic fields with eddy current effects and records power density as a function of position. **TDiff** uses the information for steady-state or dynamic thermal calculations.



Part number: TK0900.

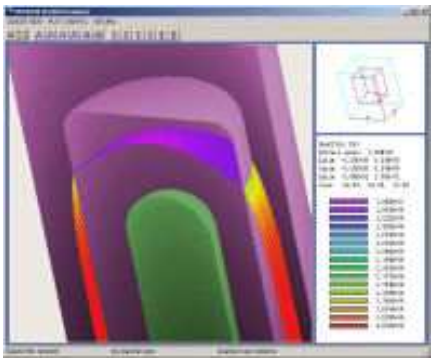
Component information: **Mesh** 6.0 (page 23), **Nelson** 6.0 (page 32) and **TDiff** 6.0 (page 29).

Advanced E&M Design Suites

Advanced design suites offer you the ultimate in 2D/3D computing power. Packages include **Mesh** (universal 2D mesh generator), **Geometer** (interactive environment for solid geometry) and **MetaMesh** (universal 3D mesh generator) at no charge.

Advanced Electrostatics Design Suite

Description: The complete tool for researchers and high-voltage engineers. 2D/3D solutions for any configuration of electrodes, dielectrics, conductors or space-charge.

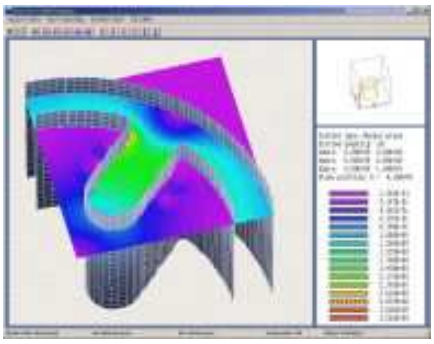


Part number: ADS0100.

Component information: **Mesh** 6.0 (page 23), **EStat** 6.0 (page 24), **Geometer** 2.5 (page 34), **MetaMesh** 2.5 (page 36) and **HiPhi** 2.0 (page 37).

Advanced Magnetic Field Design Suite

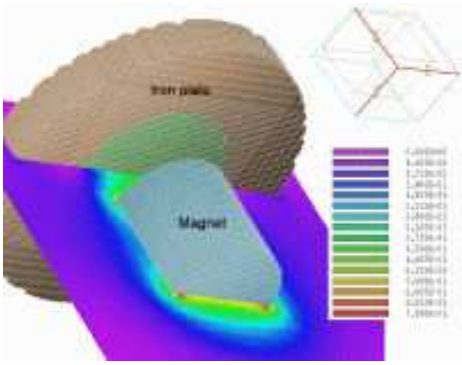
Description: 2D/3D design of magnets and permanent-magnet devices, including saturation effects in soft magneic materials.



Part number: ADS0200.

Component information: **Mesh** 6.0 (page 23), **PerMag** 6.0 (page 25), **Geometer** 2.5 (page 34), **MetaMesh** 2.5 (page 36) and **Magnum** 2.5 (page 38).

Advanced Static Field Design Suite

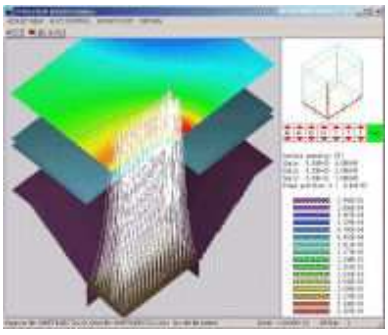


Description: Integrated 2D/3D design package addresses the full spectrum of static electric and magnetic field calculations. Applications include high-voltage engineering, capacitance and inductance calculations, permanent magnet devices, MRI magnets,....

Part number: ADS0300.

Component information: **Mesh** 6.0 (page 23), **EStat** 6.0 (page 24),**PerMag** 6.0 (page 25), **Geometer** 2.5 (page 34), **MetaMesh** 2.5 (page 36), **HiPhi** 2.0 (page 37) and **Magnum** 2.5 (page 38).

Advanced Charged Particle Design Suite

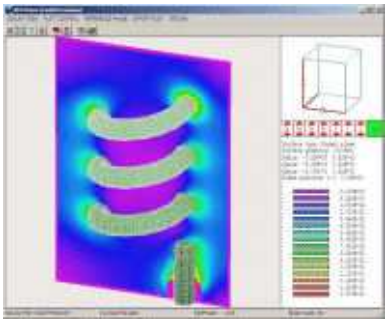


Description: The most advanced 2D/3D tools available today for simulations of electron/ion guns and charged-particle devices. Handles Child emission, multi-species flow, field emission, relativistic beams, secondary emission, self-consistent plasma meniscus and more.

Part number: ADS0400.

Component information: **Mesh** 6.0 (page 23), **EStat** 6.0 (page 24), **PerMag** 6.0 (page 25), **Trak** 7.0 (page 26), **Geometer** 2.5 (page 34), **MetaMesh** 2.5 (page 36), **HiPhi** (page 37), **Magnum** (page 38) and **OmniTrak** (page 39).

Universal Electric Field Design Suite

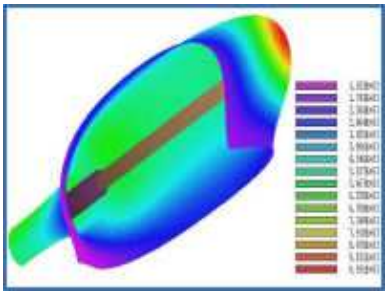


Description: A complete tool for electric fields that covers the full spectrum of applications in 2D/3D. Calculations of dielectric and conductive-type static solutions as well as AC/RF solutions in conductive dielectric media with effects of real and displacement current.

Part number: ADS0500.

Component information: **Mesh** 6.0 (page 23), **EStat** 6.0 (page 24), **RFE2** 31), **Geometer** 2.5 (page 34), **MetaMesh** 2.5 (page 36), **HiPhi** 2.0 (page 37) and **RFE3** 2.0 (page 42).

Advanced RF Heating Design Suite

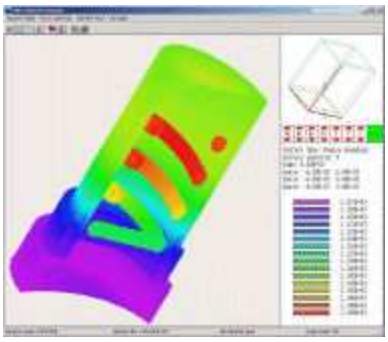


Description: Full 2D/3D calculations of RF electric field distribution and resultant heating in tissues. Define up to 127 different materials characterized by dielectric constant, electrical conductivity, specific heat, thermal conductivity, mass density, emissivity and perfusion coefficient.

Part number: ADS0600.

Component information: **Mesh** 6.0 (page 23), **RFE2** 6.0 (page 31), **TDiff** 6.0 29), **Geometer** 2.5 (page 34), **MetaMesh** 2.5 (page 36), **RFE3** 2.0 (page 42) and **HeatWave** 2.0 (page 40).

Advanced Thermal Design Suite



Description: Advanced 2D/3D finite-element programs for steady-state or dynamic thermal simulations. The codes handles radiative boundaries, blood perfusion and materials with temperature-dependent thermal properties. Initial-value solutions may include arbitrary time variations of thermal sources and surface temperatures. In this mode, the programs can record snapshots of spatial variations or probe signals at diagnostic points.

Part number: ADS0700.

Component information: **Mesh** 6.0 (page 23), **TDiff** 6.0 (page 29), **Geometer** 2.5 (page 34), **MetaMesh** 2.5 (page 36), and **HeatWave** 2.0 (page 40).

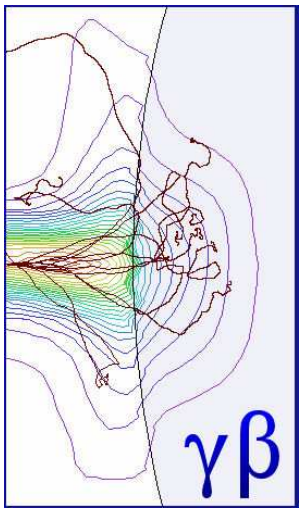
GamBet 2.0

Function

2D/3D Monte Carlo simulations of electron/photon/positron radiation transport in matter

Description

GamBet 2.0 is an innovative approach to Monte Carlo simulations of radiation transport in matter. The unitized suite handles the full range of electron/photon/positron interactions with high accuracy. **GamBet** can be used as a stand-alone tool or as an extension to the **Trak** (page 26) or **OmniTrak** (page 39) charged-particle-beam codes. Applications include optimization of X-ray targets, electron-beam heating, radiographic imaging, positron physics, radiation therapy research and shielding design.

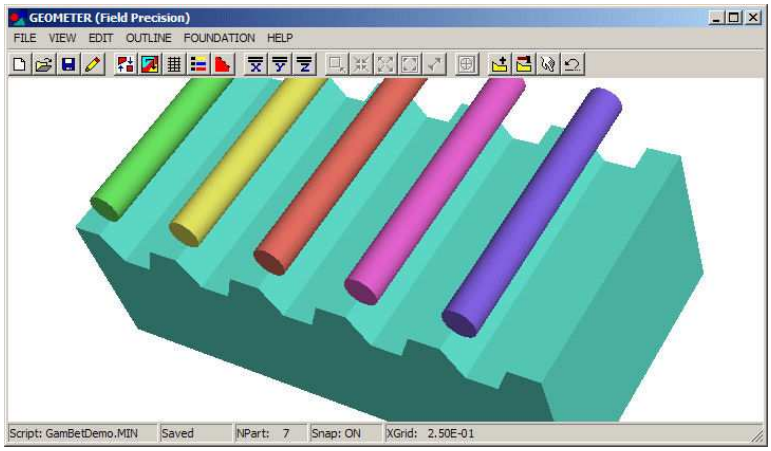


Features

GamBet has a wealth of unique features compared to other Monte Carlo software:

- Material volumes are defined by conformal meshes for accurate representation of slanted or curved boundaries
- Import 2D/3D objects from SolidWorks™, AutoCAD™, ProE™and most other CAD programs.
- Output files of deposited energy may be exported to **TDiff** or **HeatWave** for thermal analyses.
- Optimized search routines for minimum run time
- Option to incorporate calculated 2D or 3D electric and/or magnetic field solutions
- Dose quantities recorded on the conformal mesh so that each element acts as a subzone for post-processing

- **GenDist** utility for analysis and plotting of input/output particle distributions
- Advanced variance-reduction techniques including interaction forcing and splitting/reduction of particles.
- Package includes powerful graphical pre- and post-processors for mesh generation and the analysis of dose and particle orbits
- Particle escape files may be used as input for subsequent runs or ported to the **Trak** and **OmniTrak**
- Material interactions are handled by the state-of-the-art Penelope package
- Direct mesh generation from photographic or medical images
- Textbook-quality instruction manuals and ready-to-run examples



Visualize assemblies as you create them.

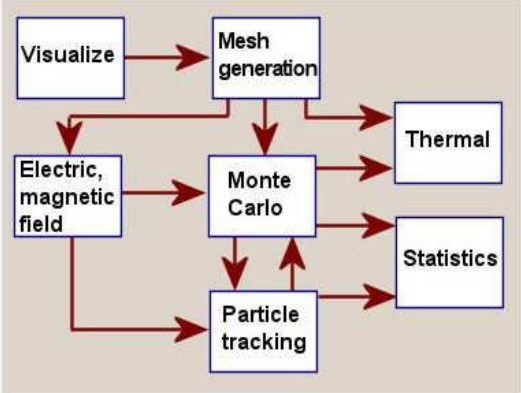
Xenos

It's about everything

Now you can have it all. The **Xenos** software suite has unprecedented power to model X-rays, electrons and their interactions. Components function as coupled or stand-alone applications for electric and magnetic field calculations, electron beam design, Monte Carlo modeling of radiation transport and thermal analysis. No other software compares for advanced features, accuracy, speed and price.

How it works

Xenos (X-ray/electron numerical optimization suite) is a suite of advanced 2D/3D finite-element programs that handles everything you want to know about X-rays and electrons. Component programs calculate electric fields, magnetic fields, charged-particle dynamics, electron-photon-positron transport in materials and thermal transport. The diagram on the right shows how the programs communicate to form an integrated package. The system geometry is defined in the interactive graphical environment of **Geometer**. **MetaMesh** uses the information to create conformal meshes of hexahedron elements for the solution programs. The same or different meshes may be used to define 1) electrodes and dielectrics for electrical field calculations (**HiPhi**), 2) coils, iron and permanent magnets for magnetic field calculations (**Magnum**), 3) elements and compounds for Monte Carlo radiation transport (**GamBet**) and 4) solid materials for thermal transport (**HeatWave**). From this point, there are several options:

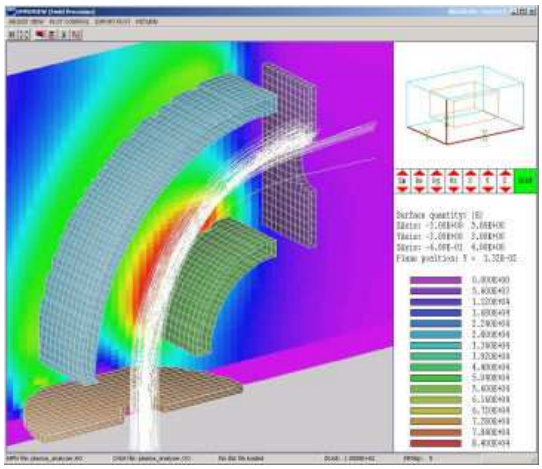


- **GamBet** can import field information from **HiPhi** and **Magnum**. In this case, electron and positron histories are influenced by Lorentz forces as well as material interactions.
- **GamBet** can transfer information to **OmniTrak** to trace orbits of particles generated in a target (*i.e.*, a positron beam).
- Field information from **HiPhi** and **Magnum** may be transferred to **OmniTrak** to design electron guns and transport systems. The resulting beam distributions may then be sent to **GamBet** to study target interactions.

- **GamBet** records the spatial distribution of deposited power density. The information is used by **HeatWave** for static and dynamic thermal simulations.
- **GenDist** performs statistical analysis of particle distributions from **OmniTrak** and Gambet.

Some calculations you can do with Xenos

- Heater power for a thermionic cathode.
- Clinical dose distributions with multiple electron or X-ray beams.
- Peak electric field in a high-voltage feethrough.
- Calibration of beam diagnostics.
- Shielding requirements and temperature profiles for an electron-beam welder.
- Resolution limits in an X-ray imaging system set by photon scattering.
- Design of bending and focusing magnets for a beam line.
- Positron production and capture in an optical system.
- Aberrations in solenoid or quadrupole lenses.
- Beam perturbations from surrounding iron structures.
- Space-charge-limited current in high-perveance electron guns.
- Heating of an X-ray target by a pulsed beam.
- Periodic permanent-magnet arrays for high-power microwave tubes.
- 3D design of sheet-beam irradiators.
- Shielding of MRI magnets.
- Numerically-exact electron orbits in magnetic or electric deflectors with 3D edge fields.
- Anything else you can imagine.

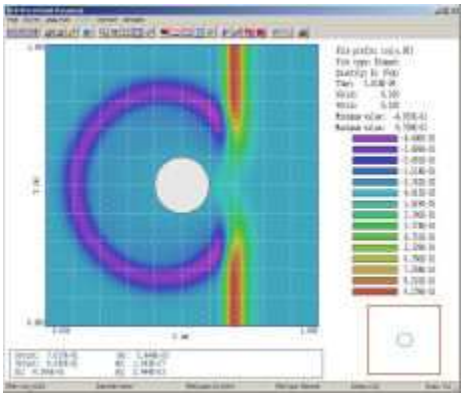


Component program information

- **GamBet 2.0**: 2D/3D Monte Carlo simulations of electron-photon-positron interactions in matter (page 17)
- **Geometer 2.5**: interactive graphical environment for 3D solid geometry (page 34)
- **MetaMesh 2.5**: universal 3D conformal mesh generator (page 36)
- **HiPhi 2.0**: static or low-frequency 3D electric fields (page 37)
- **Magnum 2.0**: static or low-frequency 3D magnetic fields with coils, iron and permanent magnets (page 38)
- **OmniTrak 2.0**: 3D design of electron guns and charged particle transport systems (page 39)
- **HeatWave 2.0**: 3D thermal transport with temperature-dependent materials and radiation boundaries (page 40)
- **Mesh 6.0**: universal 2D conformal mesh generator with integrated drawing editor (page 23)
- **EStat 6.0**: static or low-frequency 2D electric fields (page 24)
- **PerMag 6.0**: static or low-frequency 3D magnetic fields with coils, iron and permanent magnets (page 25)
- **Trak 7.0**: 2D design of electron guns and charged particle transport systems (page 26)

TriComp Program Data Sheets

This section lists individual **TriComp** program components of the **E&M Toolkits** and **Advanced E&M Design Suites**. The programs handle 2D solutions for planar and cylindrical systems. Setups are easy and solutions run quickly. Applications include high-voltage systems, magnet design, charged-particle guns and beam transport, eddy current analysis, RF heating, electromagnetic pulses, coupled thermal transport and microwave structures.

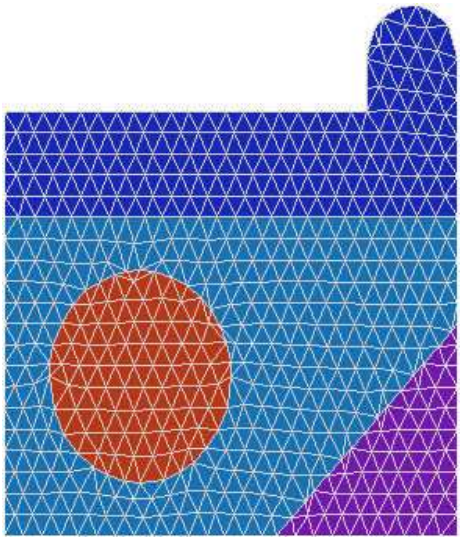


Mesh 6.0

Function

Automatic generation of 2D conformal triangular meshes.

Description



Mesh 6.0 creates conformal triangular meshes for any user-specified geometry. The term *conformal* means that the solution volume is divided into a set of individually-shaped triangles that closely follow material boundaries. The approach gives high-accuracy field solutions with short run times. The program also supports variable element resolution for enhanced accuracy in critical regions. **Mesh** includes a powerful, integrated drawing editor to define geometries graphically. The program also imports drawings in DXF format from TurboCAD, AutoCAD and other drafting programs. **Mesh** can operate interactively or from the command prompt under batch file control. In the interactive mode, you can make detailed inspections of the mesh or change the properties of individual elements and vertices.

Features

- Drawing editor with advanced features (snap modes, fillet, copy, ...).
- Automatic error corrections for high reliability.
- Publication-quality hardcopy with support for all installed Windows print devices (including color printers).
- Library of practical application examples on disk.
- Compatible with all **TriComp** solution programs.
- Formatted text output files make it easy to transfer information to user applications or your own finite-element programs.

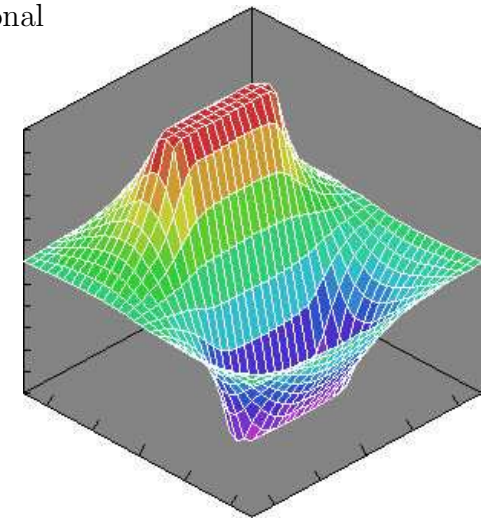
EStat 6.0

Function

Two-dimensional electrostatics (cylindrical and planar systems).

Description

EStat 6.0 is a comprehensive tool for electrostatic solutions in two-dimensional planar and three-dimensional cylindrical geometries. The program handles arbitrary geometries with multiple regions of dielectric or conductive materials. The program supports anisotropic materials. **EStat** employs advanced finite-element methods on conformal meshes for speed and accuracy. The program includes an interactive graphical environment for creating plot and analyzing solutions. Advanced capabilities include automatic calculation of field energy, peak field and capacitance. The package has application to research and production design in areas such as high voltage engineering electro-optical devices, electro-plating and particle accelerators.



Features

- Assign spatial variations of dielectric constant, conductivity and space-charge density from mathematical functions.
- Easy-to-understand instruction manual with walkthrough examples.
- xtensive plot options include equipotential contours, three-dimensional potential plots, and color-coded element plots of field magnitude.
- Publication-quality hardcopy with support for all installed Windows print devices (including color printers).
- Interactive point-and-click analysis of solutions.
- Advanced solution techniques to resolve microscopic details in large structures.

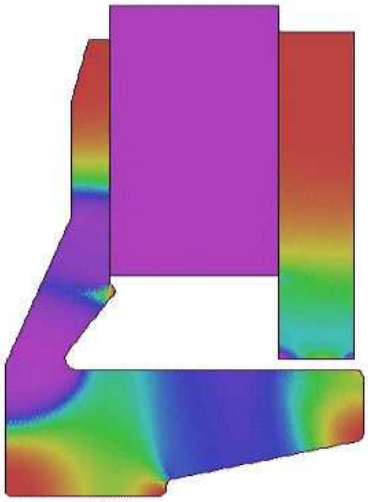
PerMag 6.0

Function

Two-dimensional magnetostatics with non-linear magnetic materials, permanent magnets, and anisotropic materials

Description

Permag 6.0 is an advanced solution package for the design of permanent magnet devices. The program calculates static magnetic fields for any geometry with planar or cylindrical symmetry. **Permag** can perform combined runs with permanent magnets, coils and ferromagnetic materials. With its open data structure, the program handles all permanent magnet materials, including non-linear materials like Alnico. A concise users' manual reviews magnetostatic theory with anisotropic materials and numerical methods for field solutions. The program features an interactive graphical environment to create a variety of plots. Analysis capabilities include automatic determination of field energy, forces and induced current for inductance calculations.



Features

- Standard PCs handle large meshes (several million elements).
- Extensive plots include field lines, three-dimensional and color-coded element plots of $|\mathbf{B}|$ and magnetic permeability.
- Library of material specifications and practical application examples on disk.
- Interactive point-and-click analysis of solutions. Option to record results from an analysis session.
- Advanced solution techniques to resolve microscopic details in large structures.

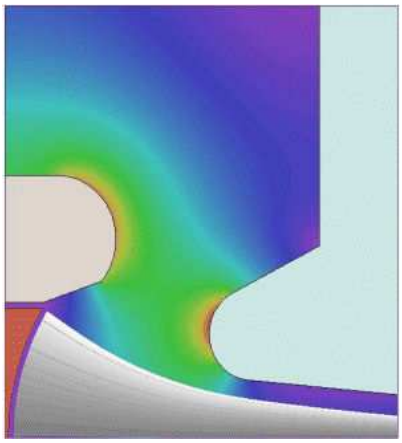
Trak 7.0

Function

Charged-particle tracking, beam transport and electron/ion gun design

Description

Trak 7.0 is the most advanced 2D code available on any computer platform for charged-particle optics and gun design. The program applies high-accuracy finite-element techniques to find individual orbits or to simulate steady-state beams. Features include effects of beam-generated electric and magnetic fields, automatic generation of input distributions, self-consistent space-charge-limited emission, and field emission. Applications include electron and ion guns, electro-optical devices, electron microscopes, vacuum microelectronics and relativistic high-power beams.



Features

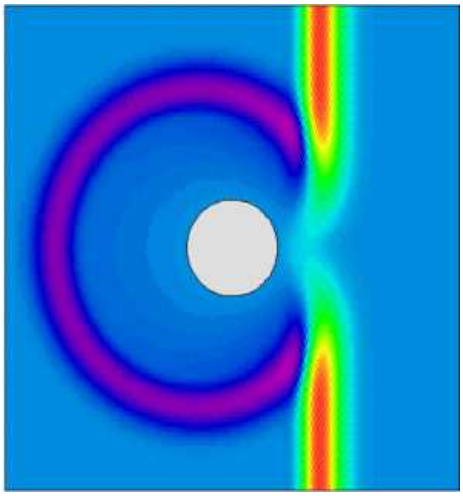
- Easy-to-understand instruction manual with a library of read-to-run examples.
- Combine effects of calculated electric and magnetic fields on independent meshes.
- Self-consistent space-charge-limited emission from multiple sources.
- Precision interpolation to stopping planes for lens characterization.
- Interactive orbit and field plotting menu with built-in hardcopy support.
- Automatic determination of self-consistent plasma surfaces for ion extraction.
- Advanced secondary-emission models and automatic tracking of multigenerational electron histories.
- Automatic calculations of emittance and current density.

EMP 6.0

Function

Finite-element time-domain analysis: simulations of electromagnetic interference and pulsed-power devices.

Description



EMP 6.0 simulates electromagnetic pulses in 2D planar geometries and 3D cylindrical systems. The program employs unique finite-element methods on conformal triangular meshes for accurate representations of curved and sloped material boundaries. Run times are short, typically a few seconds on a high-performance computer. **EMP** supports matched-termination absorbing boundaries to simulate open-space conditions. Spatial data can be analyzed quickly with integrated interactive post-processor. This program generates quantitative data and a wide variety of plots. The package also includes the **Probe** utility to plot temporal signals. **EMP** application areas include microwave devices, particle accelerators, pulsed-power generators and electromagnetic interference.

Features

- Material types include vacuum, conductors, or lossy dielectrics and ferrites.
- Use mathematical functions to define spatial variations of dielectric constant, magnetic permeability or conductivity or time variations of multiple current sources.
- Records time-dependent electric and magnetic field components at up to 50 probe locations.
- Automatic integrals of field energy density and resistive power dissipation over regions.

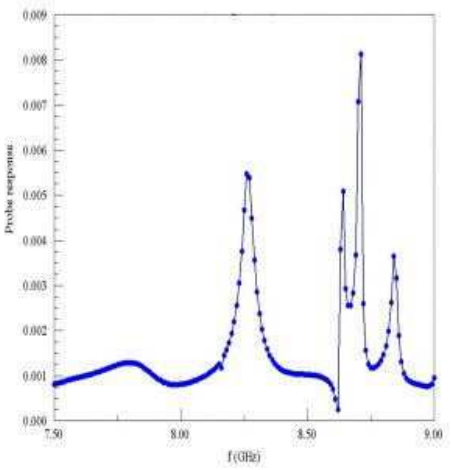
WaveSim 6.0

Function

Finite-element frequency-domain simulations of electromagnetic propagation and microwave devices

Description

WaveSim 6.0 models electromagnetic waves in 2D structures. The program finds resonant modes of cavities and waveguides and also handles scattering solutions. High-performance matched termination layers represent open-space conditions. **WaveSim** determines both near- and far-field solutions and handles absorption resulting from resistivity or imperfect material response. The program has application to radar, electromagnetic compatibility, communications, microwave devices and education.



Features

- Direct frequency- domain solutions through optimized sparse matrix inversion.
- Define up to 127 regions to represent current sources, drive boundaries, or materials.
- Automatic analyses of field energy and power dissipation in materials and cavity walls.
- Material absorption represented by imaginary parts of the dielectric constant and/or magnetic permeability.
- Automatic resonance mapping of structures.
- Extensive plot options for field lines, field magnitude and other quantities.

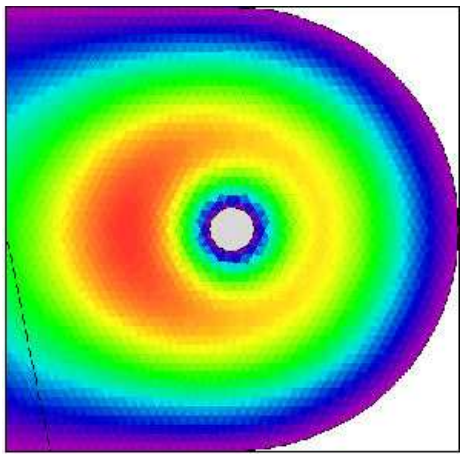
TDiff 6.0

Function

Thermal transport in solids and biological media with temperature-dependent properties.

Description

TDiff 6.0 handles dynamic or steady-state thermal transport calculations. The program uses unique finite-element techniques for high accuracy and numerical stability. **TDiff** solves nonlinear problems with temperature-dependent material properties. The program can model effects of thermal radiation boundaries and blood perfusion (bioheat equation). **TDiff** imports calculated power densities from **RFE2**, **Nelson**, **WaveSim** and **GamBet** for coupled solutions. Includes the **Probe** utility for plotting and analyzing history files.



Features

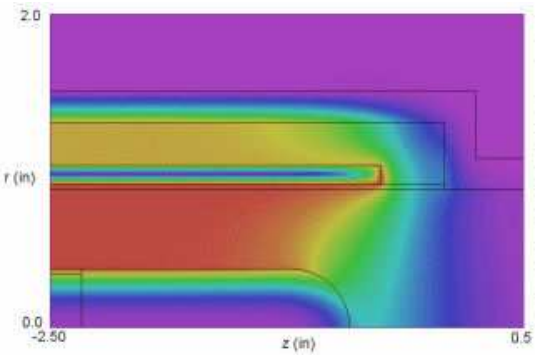
- Easy-to-understand instruction manual with a library of read-to-run examples.
- Users may define arbitrary variations in time and temperature through flexible tabular functions.
- Define up to 127 regions with different material properties.
- Handles materials with temperature-dependent properties.
- Records spatial distributions of temperature at up to 999 specified times.
- Interactive graphical environment for plots and numerical analyses.¡BR¿
- High-stability finite-element methods with automatic time-step optimization.
- Records time-dependent temperature and thermal properties at up to 50 probe locations.

Pulse 6.0

Function

Pulsed magnetic fields with induced electric fields and eddy currents

Description



Pulse 6.0 calculates the history of pulsed magnetic fields with effects of eddy currents. You can define up to 127 regions of magnetic materials, conductors and coils. The code can handle saturation waves in ferromagnetic materials. It produces direct output of magnetic field histories at given positions and spatial distributions of magnetic field, permeability and electric field at given times. In the analysis mode, the program automatically calculates magnetic forces on structures as well as currents and power dissipation. The package includes the **Probe** utility to analyze and to view temporal variations at specified points.

Features

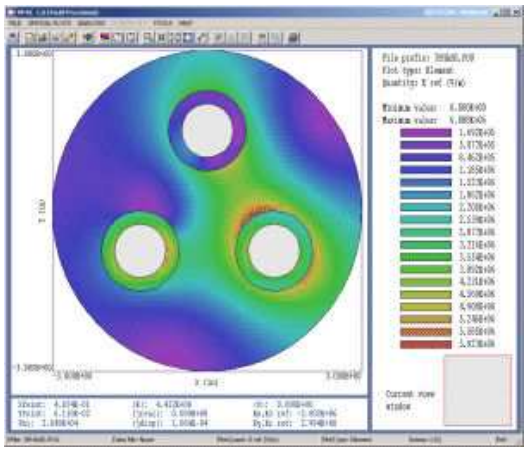
- Option to define arbitrary time variations of drive currents and magnetic flux.
- Extensive plot options include field lines, magnitude of the magnetic and induced electric fields and resistive power density.
- Textbook quality instruction manual with ready-to-run examples.
- Designed for high speed and large meshes on standard PCs.
- Interactive point-and-click analysis of solutions.

RFE2 6.0

Function

Two-dimensional RF electric fields in biological media and lossy dielectrics.

Description



RFE2 is a versatile numerical tool to calculate RF electric fields in conductive media. The program has extensive applications in RF heating and biothermal simulations. You can define up to 127 regions to represent electrodes or different materials. The amplitude and phase of the harmonic potential on electrodes can be set individually. Conductive materials are characterized by values of the volume resistivity and relative dielectric constant. Power density values can be exported to **TDiff** for thermal analysis. A interactive graphical environment provides full information on the amplitude and phase of electric field and current density throughout the solution regions.

Features

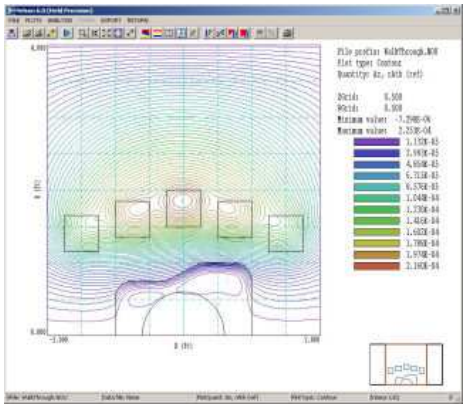
- Automatic integrals of power dissipation in region volumes and real and displacement current through region surfaces.
- Easy-to-understand instruction manual with ready-to-run examples.
- Extensive plot options include include equipotential contours at a specified reference phase, vector plots of electric field and current density and color-coded element and surface plots.
- Publication-quality hardcopy with support for all installed Windows print devices (including color printers).
- Interactive point-and-click analysis of solutions.

Nelson 6.0

Function

Two-dimensional RF and AC magnetic fields in materials with eddy currents.

Description



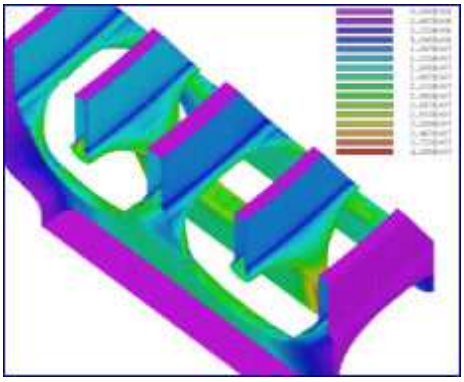
Nelson 6.0 is a versatile numerical tool to find RF and AC magnetic fields in conductive media. You can define up to 127 regions to represent coils or different materials. The amplitude and phase of the harmonic coil currents or vector potential on surfaces may be set individually. Conductive materials are characterized by values of the electrical conductivity and relative magnetic permeability. The interactive graphics analysis menu provides full information on the amplitude and phase of the magnetic field, eddy currents and other derived quantities throughout the solution regions. The program makes screen and hardcopy plots of magnetic field lines and colored screen plots of electric field and resistive energy deposition. The frequency-domain solutions of **Nelson** are limited to linear materials and excitation at a single frequency. The time-domain **Pulse** code calculates magnetic fields for non-linear magnetic materials with arbitrary drive current waveforms.

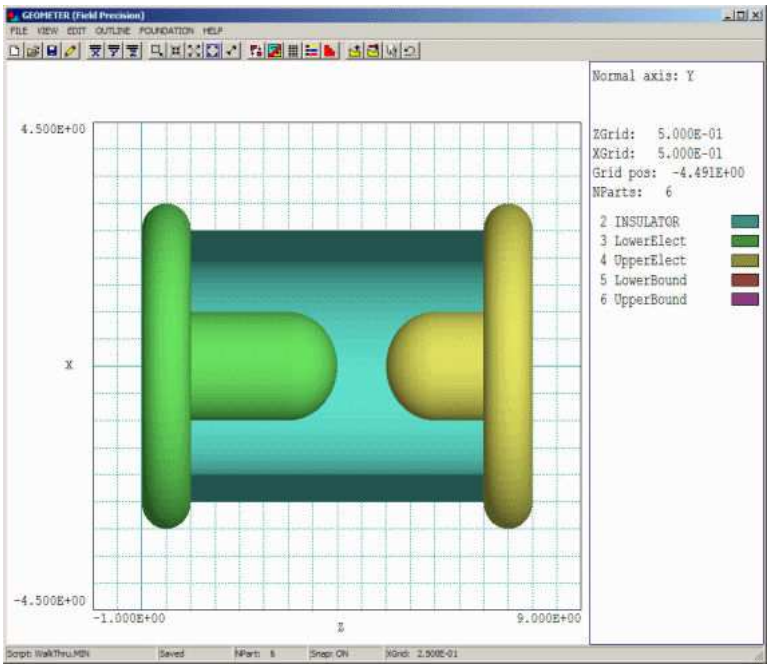
Features

- Output files may be ported to **TDiff** for coupled thermal analysis.
- Easy-to-understand instruction manual with ready-to-run examples.
- Direct plots of magnetic fields lines. Element plots of calculated quantities (magnetic field, induced electrical field, current density, power density,...).
- Publication-quality hardcopy with support for all installed Windows print devices (including color printers).
- Interactive point-and-click analysis of solutions.

AMaze Program Data Sheets

This section lists individual **AMaze** program components of the **Advanced E&M Design Suites**. **AMaze** programs generate full 3D solutions with amazing speed. Packages feature an interactive, OpenGL-based graphical editor and an automatic conformal mesh generator. Applications include electrostatics, magnetostatics with permanent magnets and saturable materials, charged-particle guns and beam transport, RF heating and thermal transport.





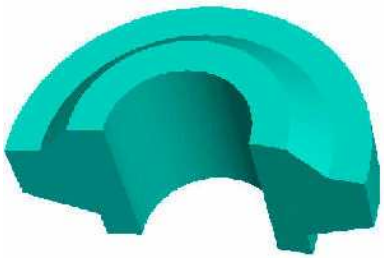
Geometer 2.5

Function

Creation of 3D assemblies in an interactive, graphical environment.

Description

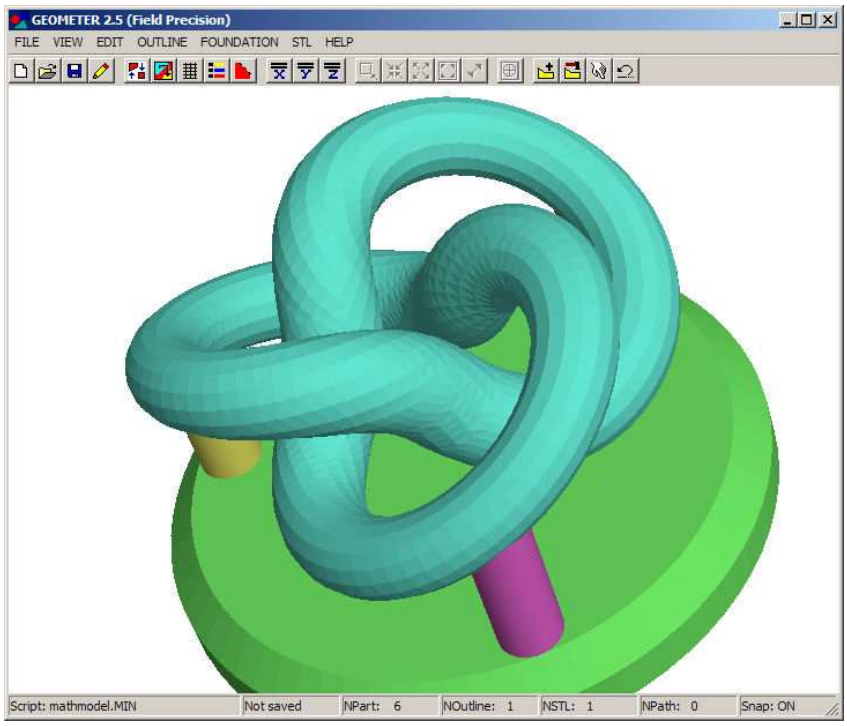
The **Geometer/MetaMesh** package offers unparalleled ease-of-use for 3D mesh generation. **Geometer** is an interactive, graphical environment to create geometric specifications for **MetaMesh**. You can build complex assemblies as you move freely through space with advanced visualization tools.



Features

- OpenGL support gives you the sense of being inside the system with complete freedom to move about 3D space.
- Easy import of complex parts via STL files from SolidWorks™, ProE™, AutoCAD™, NX™and other 3D CAD programs.

- Mouse-controlled perspective views with real-time animation.
- Variety of orthographic views with reference grids and coordinate tools for precision work.
- Extensive set of interactive dialogs allows you to add, modify or reorder parts in a few seconds.
- Includes a two-dimensional drawing editor to design cross-sections of extrusions and turnings.
- Comprehensive documentation and a library of prepared examples

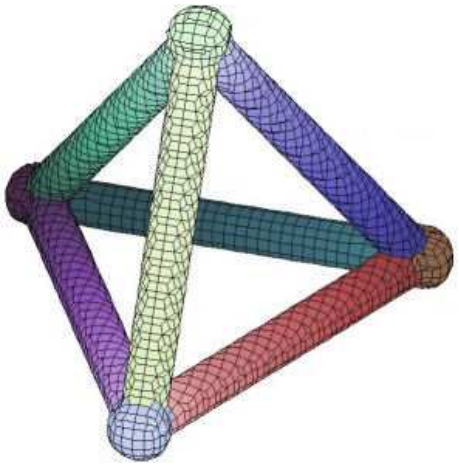


MetaMesh 2.5

Function

Automatic generation of 3D conformal hexahedron meshes.

Description



MetaMesh 2.5 is a versatile, fast and easy-to-learn program to create conformal 3D meshes for finite-element calculations. In a conformal mesh, elements are individually shaped to match object boundaries. The faithful representation of surfaces and the extended node coupling of the hexahedron mesh account for the high accuracy of **AMaze** programs. The **MetaMesh** script is a simple and well-documented format for the definition of arbitrary three-dimensional structures. You can use the **Geometer** program to create scripts in an interactive, graphical environment. **MetaMesh** has the unique capability to create ideal structured meshes of conformal elements. Structure ensures that solution programs use memory efficiently and run at top speed.

Features

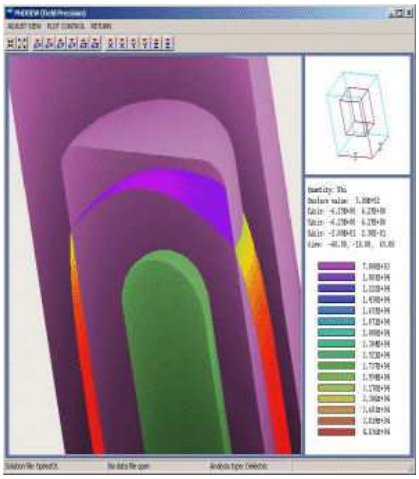
- Easy import of complex parts via STL files from SolidWorks™, ProE™, AutoCAD™, NX™and other 3D CAD programs.
- Detailed instruction manual, ready-to-run examples and an on-line help file.
- Extensive shape-model library (including extrusions and turnings with arbitrary cross sections).
- Powerful visualization tools to check meshes.
- Automatic error correction for high reliability.
- Option to run autonomously in batch mode.

HiPhi 2.0

Function

Three-dimensional electrostatics.

Description



HiPhi 2.0 offers unparalleled computational power, speed and accuracy for 3D electrostatics at a moderate price. The program handles user-specified geometries that may contain regions of electrodes, dielectrics, space-charge and resistive materials. The package includes the **PhiView** postprocessor for plots and interactive analyses. The program has unparalleled speed – a 200,000-node calculation takes less than 1 minute on a typical PC. **HiPhi** has application to areas such as high-voltage engineering, circuit component design, electro-optical and vacuum microelectronic devices, electroplating and electrostatic equipment.

Features

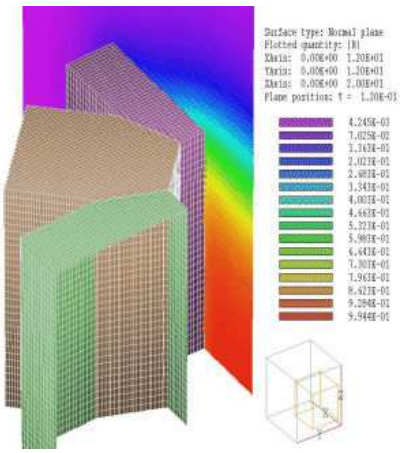
- Specify continuous spatial variations material properties from mathematical functions.
- Comprehensive instruction manual and a library of ready-to-run examples.
- Advanced solution techniques to resolve microscopic details in large structures.
- Interactive point-and-click analysis of solutions with an extensive array of 2D and 3D plotting options.
- Option to run **HiPhi** and **PhiView** in batch mode for extended calculations.
- Automatic surface integrals of normal fields to calculate mutual capacitances and electrode currents.

Magnum 2.0

Function

Three-dimensional magnetostatics with coils, high-permeability materials and permanent magnets.

Description



Magnum 2.5 is the complete tool for 3D finite-element magnetostatic calculations. The program achieves unprecedented accuracy and speed at a moderate price. **Magnum** can perform three types of calculations: 1) free-space fields in unbounded volumes for given applied currents, 2) bounded fields in the presence of coils, permanent magnets and saturable isotropic ferromagnetic materials and 3) pulsed fields in regions with ideal conductors. The package includes two additional programs: **MagWinder** (an interactive preprocessor to construct three-dimensional drive coils) and **MagView** (a postprocessor for 2D/3D plots and analyses). **Magnum** has extensive applications to the design of magnets (with and without iron) and permanent magnet assemblies.

Features

- Self-consistent calculations with saturable magnetic materials like iron, Utility program to convert hysteresis tables for any material.
- Easy-to-understand instruction manual with walkthrough examples.
- Interactive point-and-click analysis of solutions with an extensive array of 2D and 3D plotting options.
- New solution techniques resolve microscopic details in large structures.
- Volume integrals of field energy to determine inductance.
- Batch-mode operation for automated analyses.
- Advanced interpolation techniques with intelligent-point-selection for high-accuracy field calculations.

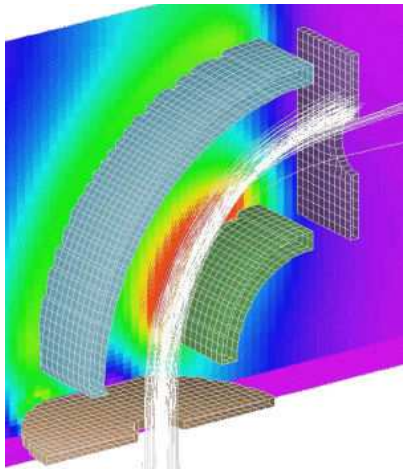
OmniTrak 2.0

Function

Charged-particle orbits and collective beam physics in electric and magnetic fields.

Description

OmniTrak 2.0 is the most advanced software tool available on any platform for the analysis of 3D charged-particle devices. The program combines finite-element methods with sophisticated interpolation techniques for fast and accurate orbit calculations. **OmniTrak** packages are complete tools that handle mesh generation, field solution, particle initiation, orbit tracking and analysis. **OmniTrak** has applications to areas such as high-power microwave sources, vacuum microelectronics, photomultipliers, particle accelerators, electrostatic and magnetostatic spectrometers, electron microscopes, ion-mobility spectrometers and high-power relativistic beams.



Features

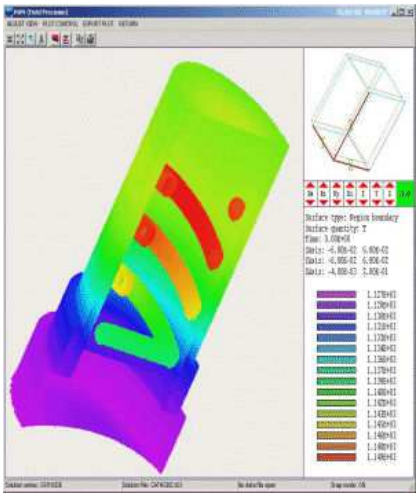
- Option to combine the effects of calculated electric and magnetic fields on independent 3D meshes.
- Unique capability for self-consistent simulations of intense relativistic electron beams with full 3D calculations of beam-generated magnetic fields.
- Self-consistent space-charge-limited emission routines support multiple species and emission sites.
- Precision interpolation to stopping planes for lens characterization. Batch-mode operation for automated analyses.
- Package includes GenDist for automatic creation of input distributions and OmniView for plots and analyses.
- Calculations of drift trajectories and transit times in ion-mobility mass spectrometers.

HeatWave 2.0

Function

Thermal transport in solids or biological media with temperature-dependent material properties.

Description



HeatWave 2.0 applies high-accuracy finite-element methods to solve the steady-state or dynamic thermal equations. The program handles radiative boundaries, blood perfusion and materials with temperature-dependent thermal properties. In initial-value solutions you can define arbitrary time variations of thermal sources and surface temperatures. In this mode, the program can record snapshots of spatial variations or probe signals at points. The package contains three programs: 1) **HeatWave** creates one or more thermal solutions interactively in a window or under batch file control, 2) **HWV** generates 2D/3D plots and performs quantitative analyses and 3) **Probe** displays signals from thermal probes.

Features

- Load power-density profiles from **RFE3** or **Gambet**, with the option to include user-defined temporal modulation functions.
- Easy preparation of run control scripts through interactive dialogs.
- Define arbitrary time variations of power density and temperature in dynamic runs.
- Option to run programs in background under batch file control.
- Unique 3D plots showing boundaries of regions with color-coding by surface temperatures or thermal flux.
- Automatic global and region calculations of average temperature and thermal flux.

- Represent nonlinear materials through flexible tabular input of temperature dependence.
- Automatic construction and display of 3D isothermal surfaces.
- Easy-to-understand instruction manual with library of read-to-run examples.

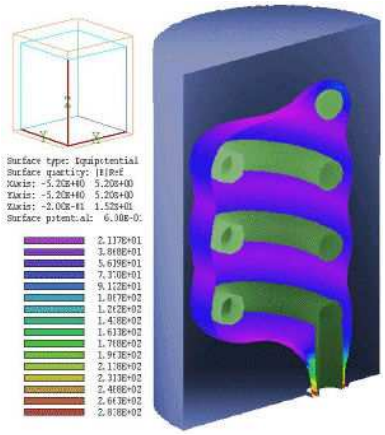
RFE3 2.0

Function

Three-dimensional RF electric fields in biological media and resistive materials

Description

RFE3 2.0 calculates RF electric fields in resistive media. The program employs finite-element methods for high-accuracy. The package includes **RFE3View**, an interactive analysis program to find spatial variations of the amplitude and phase of electric fields and current. **RFE3** has application to areas such as industrial RF treatments, geological measurements and biomedical procedures.



Features

- Export power-density profiles to **HeatWave** for thermal analyses.
- Define spatial variations of relative dielectric constant and electrical conductivity from mathematical functions.
- New solution techniques resolve microscopic details in large structures.
- Automatic surface integrals to calculate mutual capacitance, resistance and net current.
- Define up to 127 material regions with specified conductivity and relative dielectric constant.
- Batch-mode operation for automated analyses.
- The voltage amplitude and phase of electrodes may be set individually.
- Advanced interpolation techniques with intelligent-point-selection for high-accuracy field calculations.

Software Order Form

Please print and fill out the form and FAX it to us at +1-617-752-9077 or send it by mail to Field Precision, PO Box 13595, Albuquerque, NM 87192 U.S.A. We will confirm the order by E mail and set up an electronic download. There is no handling or setup charge. There is a $25.00 charge if your require a CD shipped by mail.

Program/package name	**Part number**	**Price**
Physical shipment of CD (+$50.00)		
	Total	

MasterCard/Visa/AmEx information

Card number: _____

Expiration date: _____

Customer name on card: _____

E mail address: _____

Organization: _____

Address: _____

Town/State or province: _____

Country/Postal code: _____