INTEGRATED
ENGINEERING SOFTWARE

SENSORS ANALYSIS SOFTWARE

Hybrid simulation tools for electromagnetic and particle trajectory design analysis

SOFTWARE THAT LIVES UP TO THE

POWER OF YOUR IDEAS

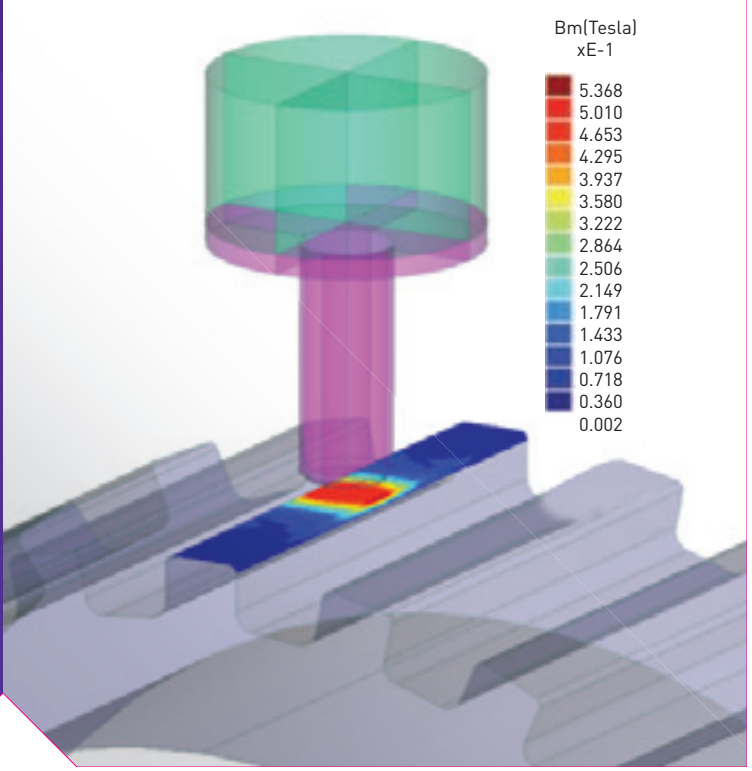
Magnetic Field Solvers

Magnetic Field Analysis is at the heart of many sensor systems, particularly systems with large air gaps.

These applications can be easily modeled using **MAGNETO** (if 2D or Rotational Symmetric) or **AMPERES** (where full 3D analysis is required).

Both programs provide a complete range of analysis options including field plots, flux linkage and inductance calculations. Force, torque, power loss and stored energy can also be calculated.

Magnetic Flux Density plot on a gear tooth modeled in **AMPERES**



Eddy Current/ Transient Field Solvers

Eddy Current sensors are employed in a wide range of applications, particularly in the field of **Non Destructive Testing**.

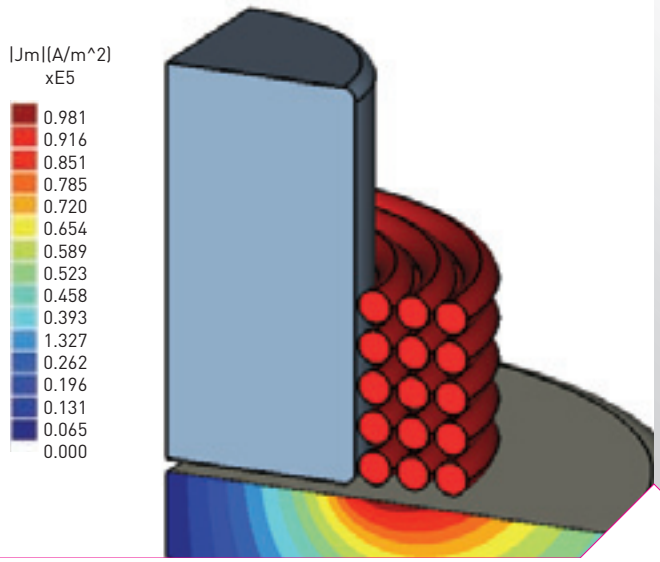
Effects of induced currents and/or transients can be simulated using **OERSTED** (if 2D or Rotational Symmetric) or **FARADAY** (where full 3D analysis is required).

Current densities in conductors can be calculated for steady state sinusoidal sources, or for completely general user defined transient signals. Both **skin effects** and **proximity effects** are included as part of the field solution.

True AC resistance and power loss of coils can be obtained.

In addition **OERSTED** and **FARADAY** contain the full capabilities of **MAGNETO** and **AMPERES** (respectively) in cases where only static analyses are required.

Contour Plot of Eddy Currents induced in a conductive plate modeled in **FARADAY**



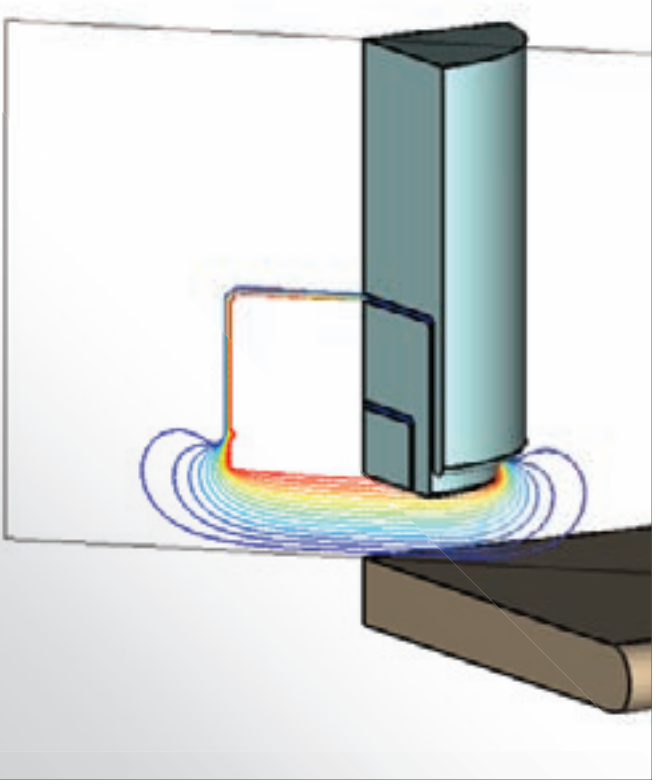
Electric Field Solvers

Sensors employing interactions of electric fields are often used in area requiring high precision measurements.

Static, phasor or completely general transient electric fields can be simulated using **ELECTRO** (if 2D or Rotational Symmetric) or **COULOMB** (where full 3D analysis is required).

Both programs provide a complete range of analysis options including field plots and capacitance calculations. Force, torque, and stored energy can also be calculated.

Plot of Voltage Contours between a capacitive sensor and conductive target modeled in **COULOMB**



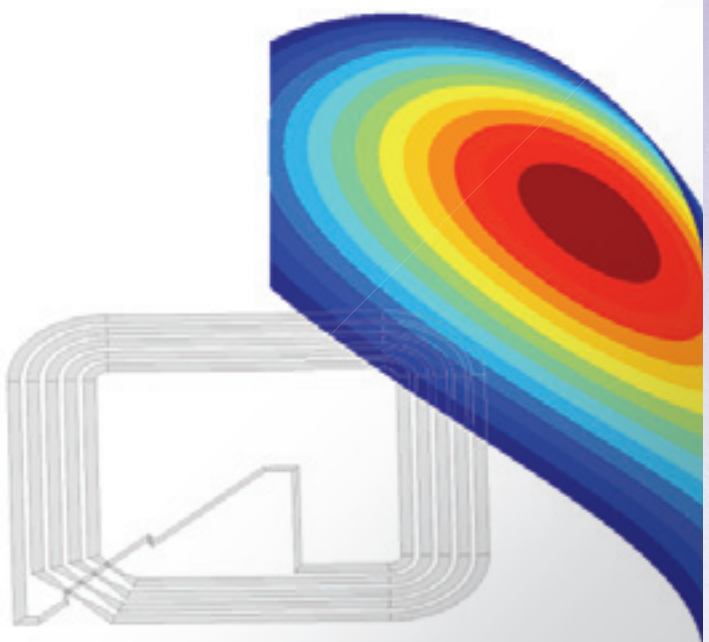
High Frequency Field Solvers

Sensors based on high frequency electromagnetic radiation and scattering effects can be modeled in **SINGULA** and/or **CHRONOS**.

SINGULA is a frequency domain field solver while **CHRONOS** is based on the **Finite Difference Time Domain (FDTD)** method.

Both programs provide near field and far field analysis results, as well as impedance, admittance and scattering matrices.

Near Field Contour Plot of Poynting Vector from RFID antenna modeled in **SINGULA**



FIND THE BEST SOLVER FOR YOUR PARTICULAR APPLICATION

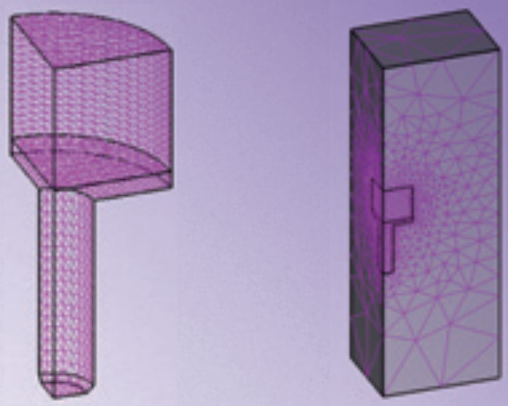
INTEGRATED provides sensor designers with the best solver for their particular applications.

The most common sensor applications can be analyzed with either the **Boundary Element Method (BEM)** or the **Finite Element Method (FEM)**.

BEM is often the preferred method since many sensor applications involve both large regions of open space and small airgaps. **BEM** requires neither artificial boundaries to limit the model space, nor meshing of empty space regions.

FEM is particularly well suited to transient simulations which involve the field solution at a large number of time steps.

An additional advantage to having both solution methods is the ability to confirm the validity of models using two independent solvers based on entirely different mathematical formulations.



Permanent Magnet and Pole Piece modeled using **BEM**. *No artificial boundary box or meshing of open regions is required.*

Permanent Magnet and Pole Piece modeled using **FEM**. *A boundary box to limit the model space is required, as is meshing of the entire simulation space.*

OPTIMIZE YOUR DESIGNS

USING INTEGRATED API, PARAMETRIC AND/OR SCRIPTING CAPABILITIES

All **INTEGRATED** programs come with **API**, **Parametric** and **Scripting** capabilities.

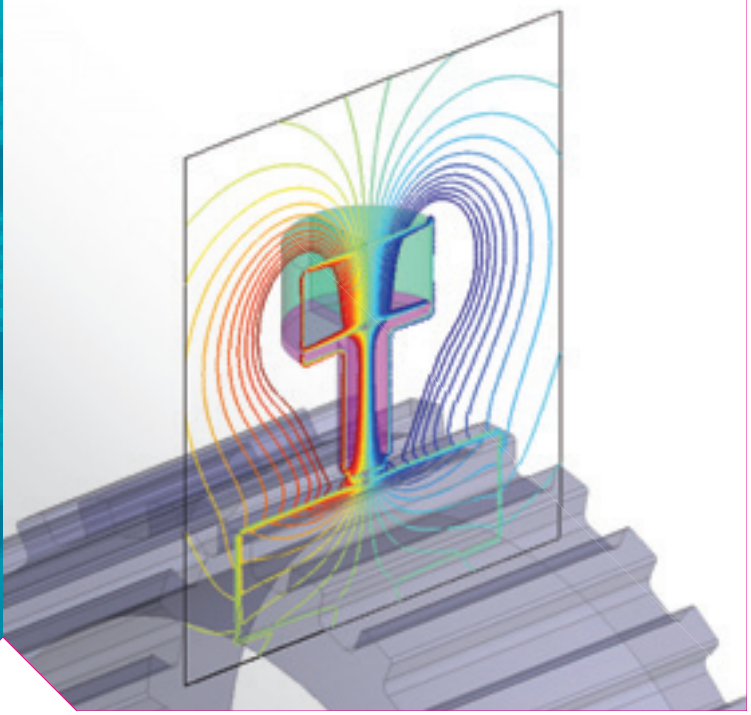
Parametrics provides an easy to learn **GUI** based method of testing sensors through their range of operating conditions, as well as modifying basic designs to obtain optimum performance.

The **INTEGRATED API** enables the direct control of program functions by utility scripts or macros created in tools such as **EXCEL** and **Visual Studio**. Scripting can control the entire process of model creation and testing.

INTEGRATED's CAE Software Tools for Sensor Designers

INTEGRATED's suite of CAE software products provides a complete toolbox for sensor designers who must consider electromagnetic effects in their systems.

- Programs that cover the range of physical systems including magnetic, electric, eddy current and high frequency field solvers
- Mathematical Solver methods optimized for each particular application
- Direct import of models from CAD Partners including: **Autodesk**, **PTC**, **Solid Edge** and **SolidWorks**
- **STEP**, **SAT** and **openNURBS (.3DM)** import from general 3D CAD programs
- **Parametric** utility for prototype testing and optimization
- **API** and **Scripting** for fast automated custom designs



"Why should I use CAE software in sensors design?"

Sensors are the key components of measurement, monitoring and control systems. In particular the precision of a control system cannot be greater than the precision of the sensor used to measure the controlled variable.

Electromagnetic principles are at the heart of many types of sensor systems. In some cases the variation of an electromagnetic parameter is directly related to the measured quantity as in the case of a capacitive position sensor. In other cases electromagnetics are used indirectly as in the case of the magnetic pickup of a turbine flow meter.

Even in cases where electromagnetics play no role in the measurement process, they may be an important consideration for the safe operation of the system as in the case of high voltage systems which must be protected by adequate insulation levels.

CAE software is an essential design tool for any sensor system that requires analysis of electromagnetic fields. Without the insights that only CAE software can provide, the design process will almost always revert to inefficient and expensive trial and error prototyping.

PUT OUR SOFTWARE TO THE TEST

Send us your model, whatever the level of complexity. We will show you how to get results from your exact design – no canned demos.

Contact us for an evaluation and start improving productivity today. A live demo is also available.

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