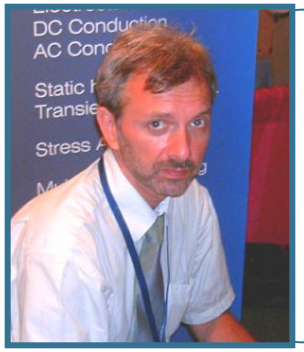
QuickField simulations for electron/ion optics



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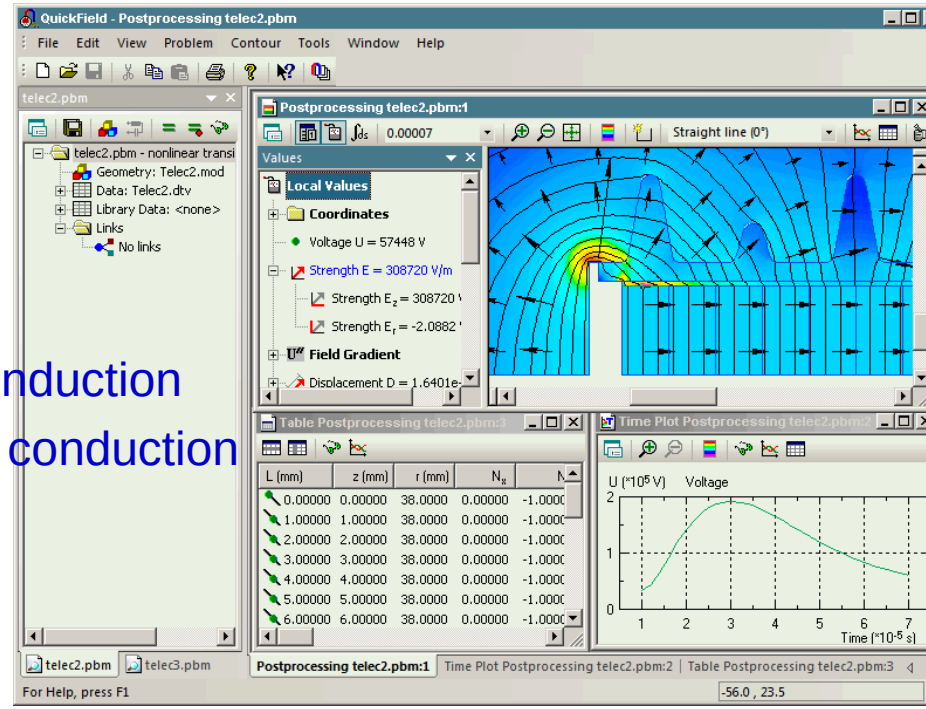
QuickField Analysis Options

- Magnetic Suite
  - AC Magnetics
  - Transient + DC Magnetics
    - DC Magnetics
- Electric Suite
  - AC conduction + Electrostatics & DC conduction
  - Transient Electric + Electrostatics & DC conduction
    - Electrostatics & DC conduction
- Thermostructural
  - Stress Analysis
  - Transient Heat transfer
    - Steady State Heat transfer



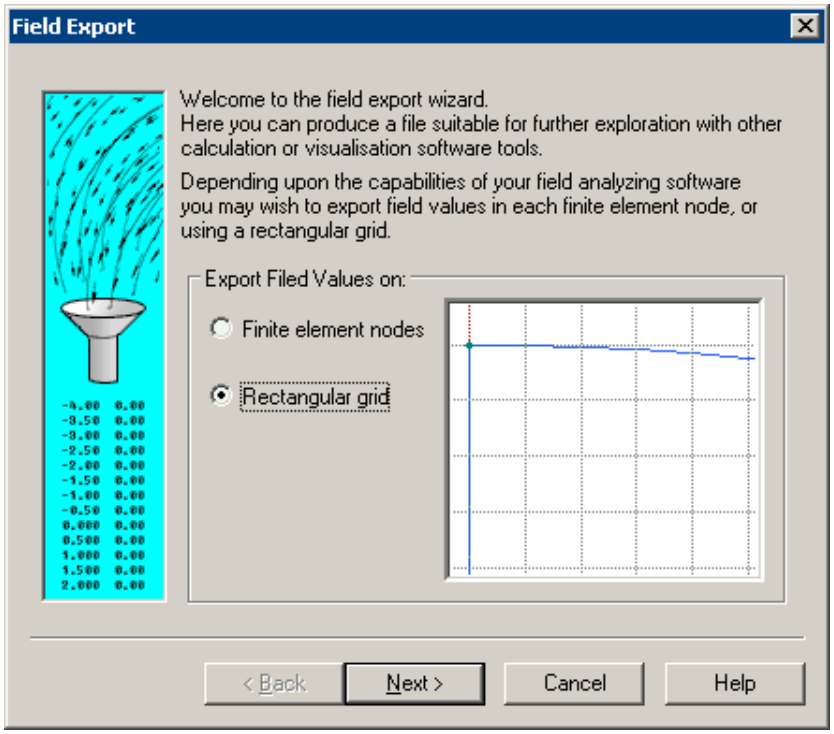
Non-relativistic particle mechanics

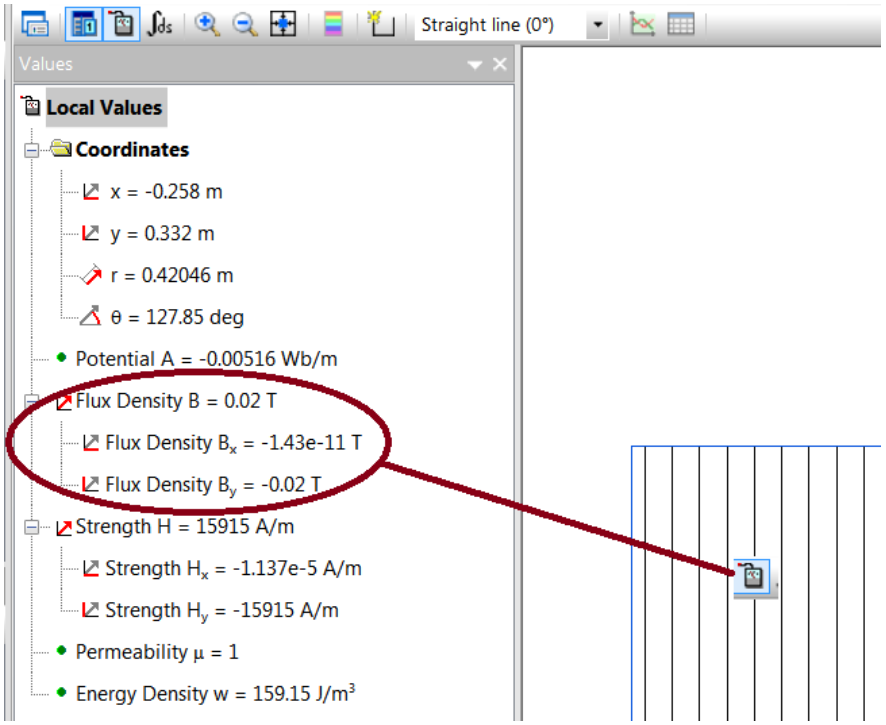
$$\mathbf{F} = q\,(\mathbf{E} + \mathbf{V}\times\mathbf{B})$$

$$\mathbf{dV/dt} = \mathbf{F}/m$$

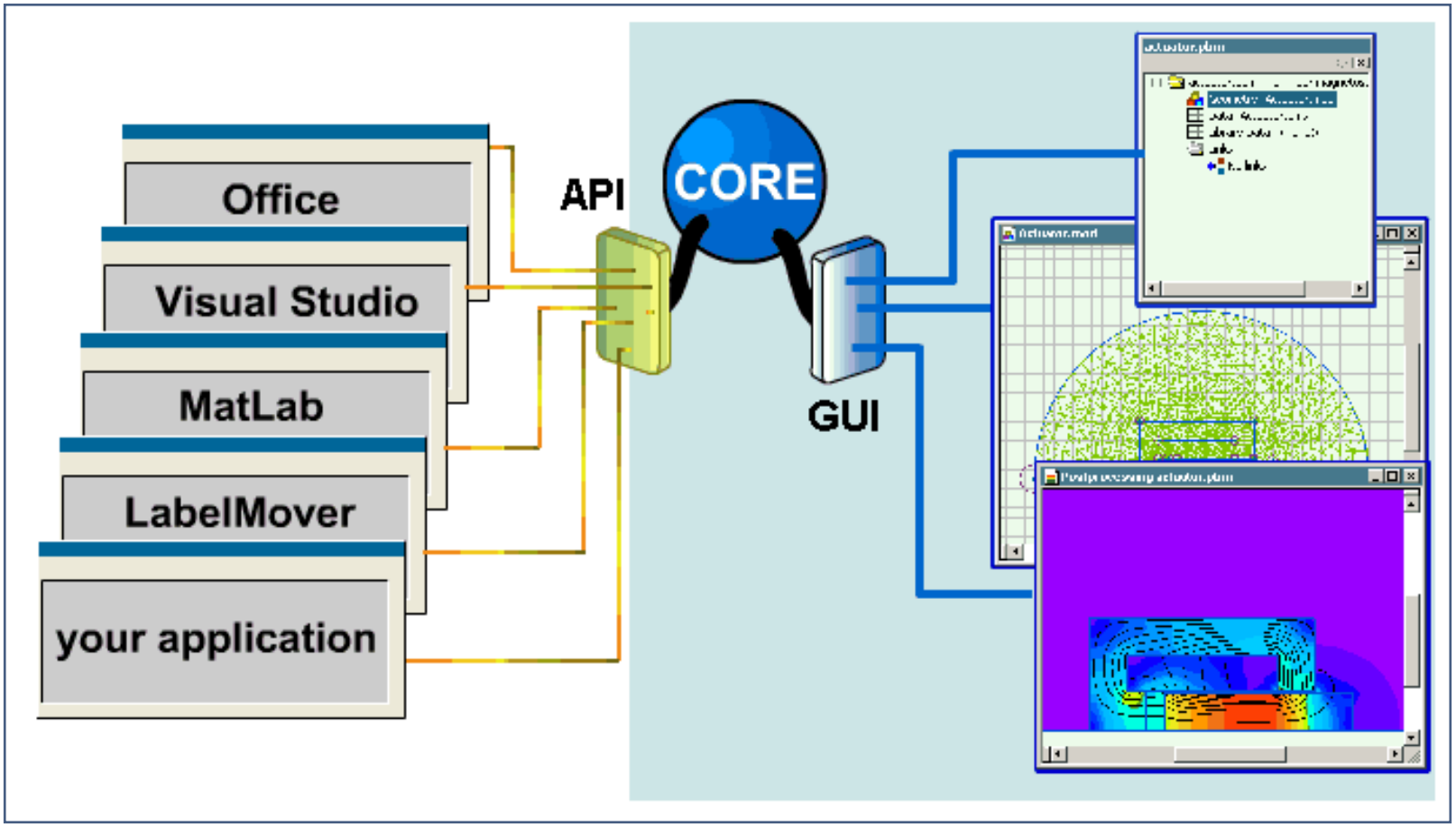
F – Lorentz force [N]
E – electric field strength vector [V/m]
B – magnetic field flux density vector [T]
V – particle speed vector [m/s]
q – particle charge [C]
m – particle mass [Kg]

Field export and local values





Open object interface



ActiveField API object model

ActiveField™ help Main QuickField Site Free Downloads Contacts

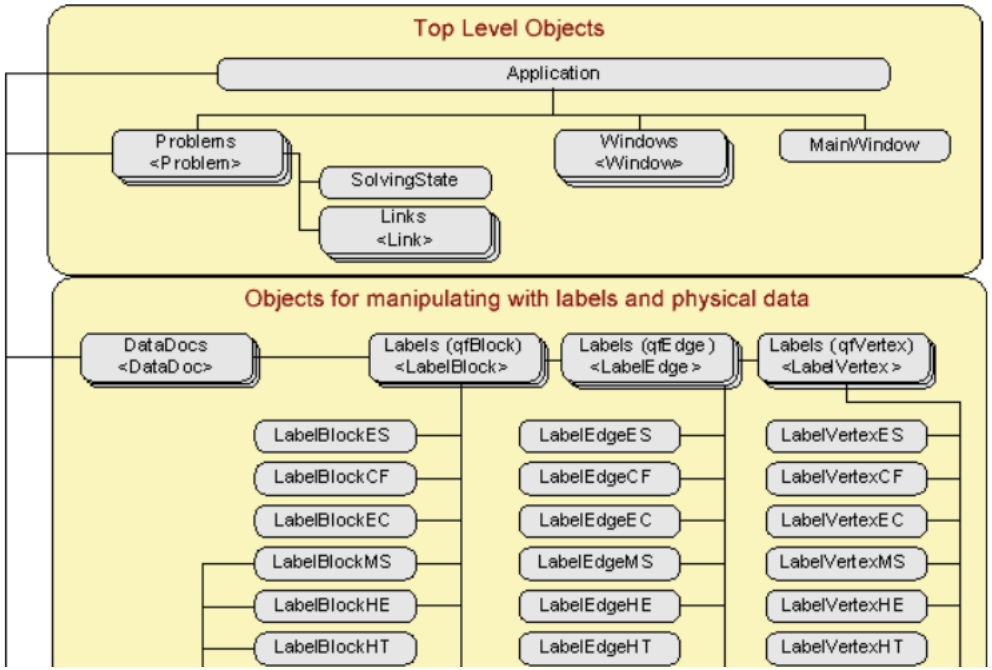
ActiveField Technology
Objects Overview
Hierarchy Chart
How to Start: Application Object
How to work with Problems
How to work with Model
How to work with Data
How to Analyze Results

Objects

Properties

Methods

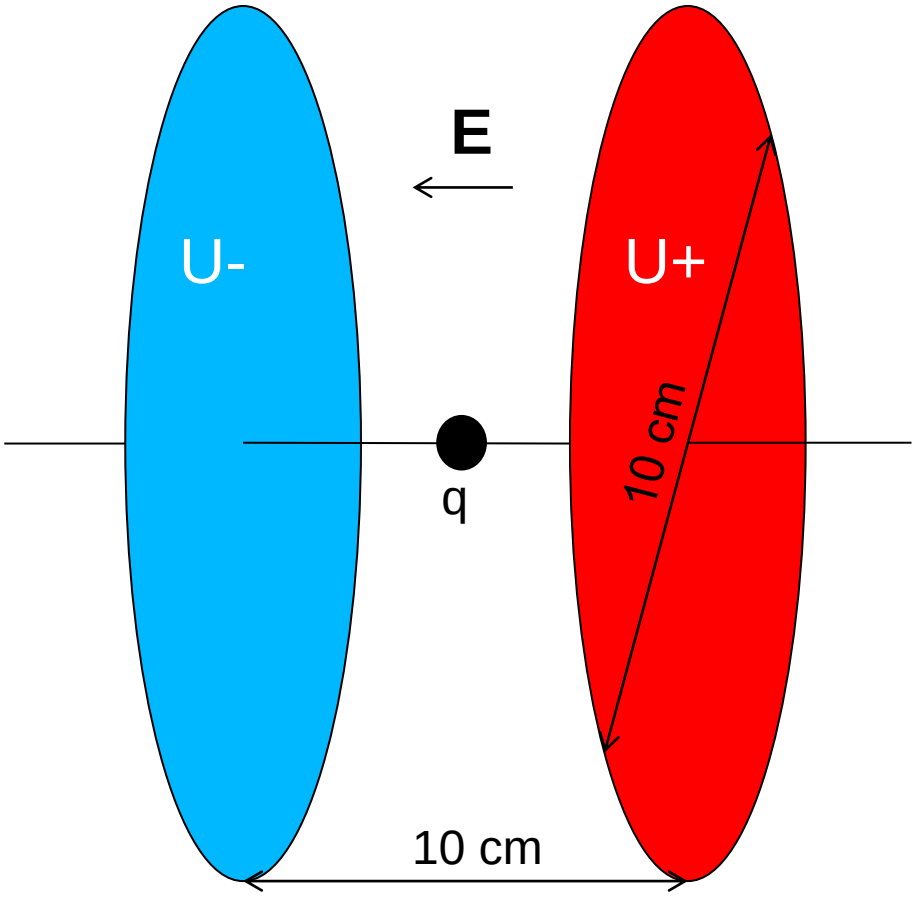
QuickField Object Model



QuickField simulations for electron/ion optics

1. Charged particle in uniform electrostatic field (capacitor).
2. Electrostatic particle accelerator.
3. Charged particle in uniform magnetic field (coil)
4. Electron lens

Charged particle in uniform electrostatic field



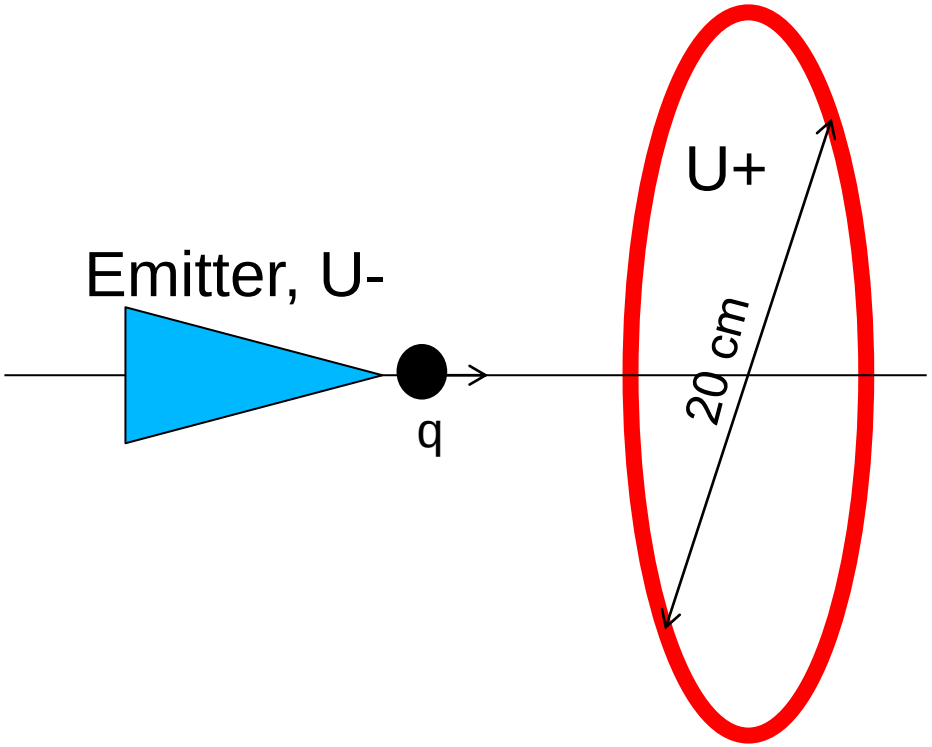
Problem specification:

U- = 0 V
U+ = 1 V
q = -1.602E-19 C
m = 3.602E-19 kg

Lorentz force:

$\mathbf{F} = q\,\mathbf{E}$

Electrostatic particle accelerator



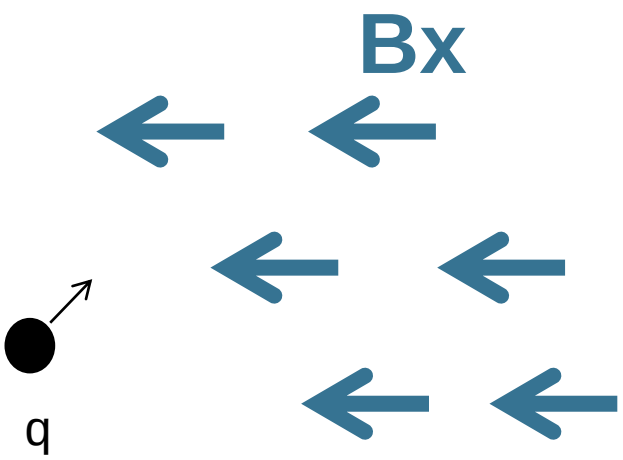
Problem specification:

U- = - 15 kV
U+ = +15 kV
q = -1.602E-19 C
m = 9.109E-31 kg

Lorentz force:

$\mathbf{F} = q\,\mathbf{E}$

Charged particle in uniform DC magnetic field



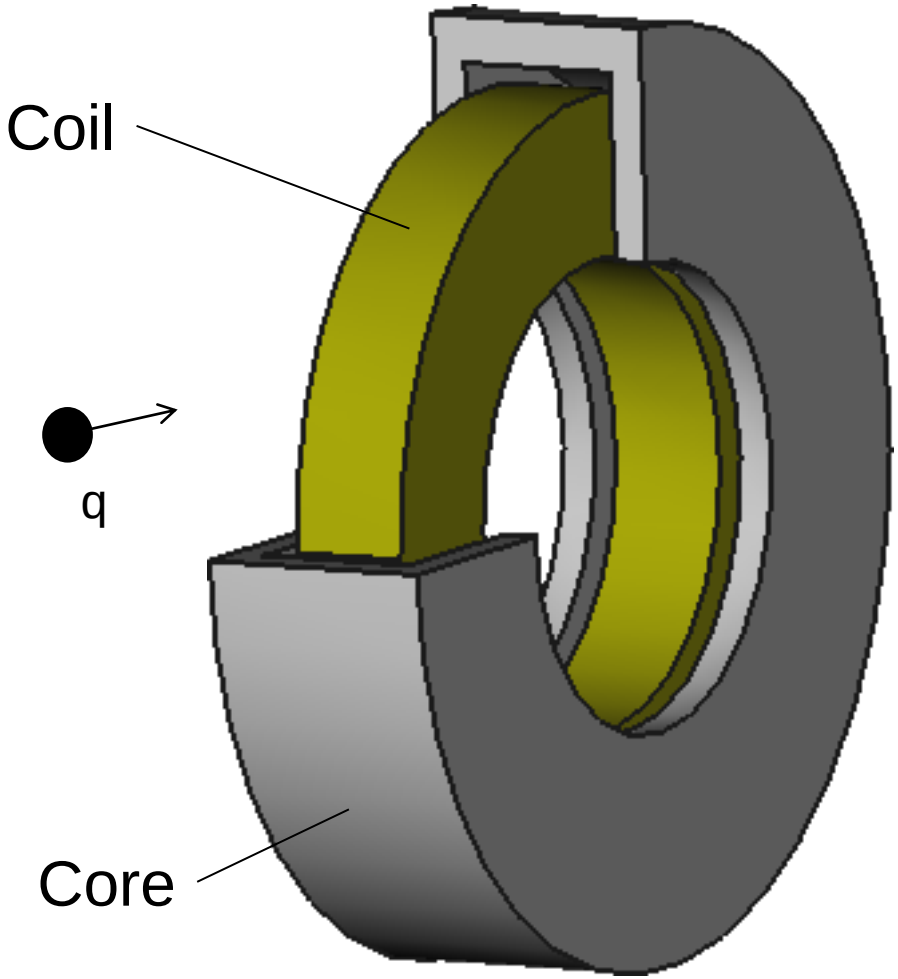
Problem specification:

Bx = -4 mT
q = -1.602E-19 C
m = 9.109E-31 kg
Vx = Vy = 500 km/s

Lorentz force:

$\mathbf{F} = q\,[\mathbf{V} \times \mathbf{B}]$

Electron lens



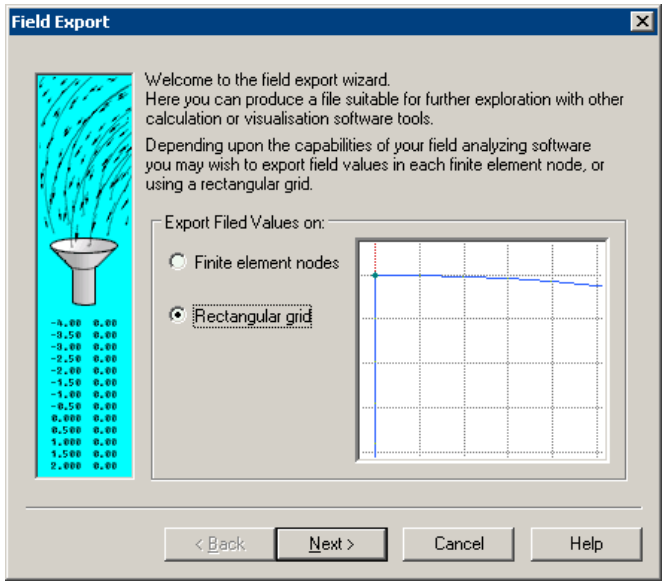
Problem specification:

Coil current I = 10 A
q = -1.602E-19 C
m = 9.109E-31 kg
Vy = 300 km/s
Vz = 1000 km/s

Lorentz force:

$\mathbf{F} = q\,[\mathbf{V} \times \mathbf{B}]$

Field export to specialized programs



Garfield is an open-source code developed by Dr. Rob Veenhov from CERN for the detailed simulation of the gaseous detectors.
http://garfield.web.cern.ch/garfield/

SIMION is a software package by Scientific Instrument Services Inc. for charged particle optics simulation.
http://simion.com/info/quickfield.html

SIMION and QuickField integration