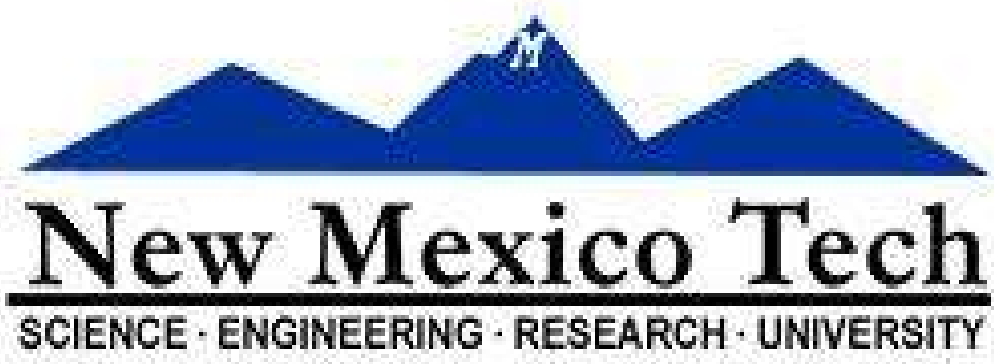


Simulation Program for Multi-Pass Time of Flight (MtoF) Separator

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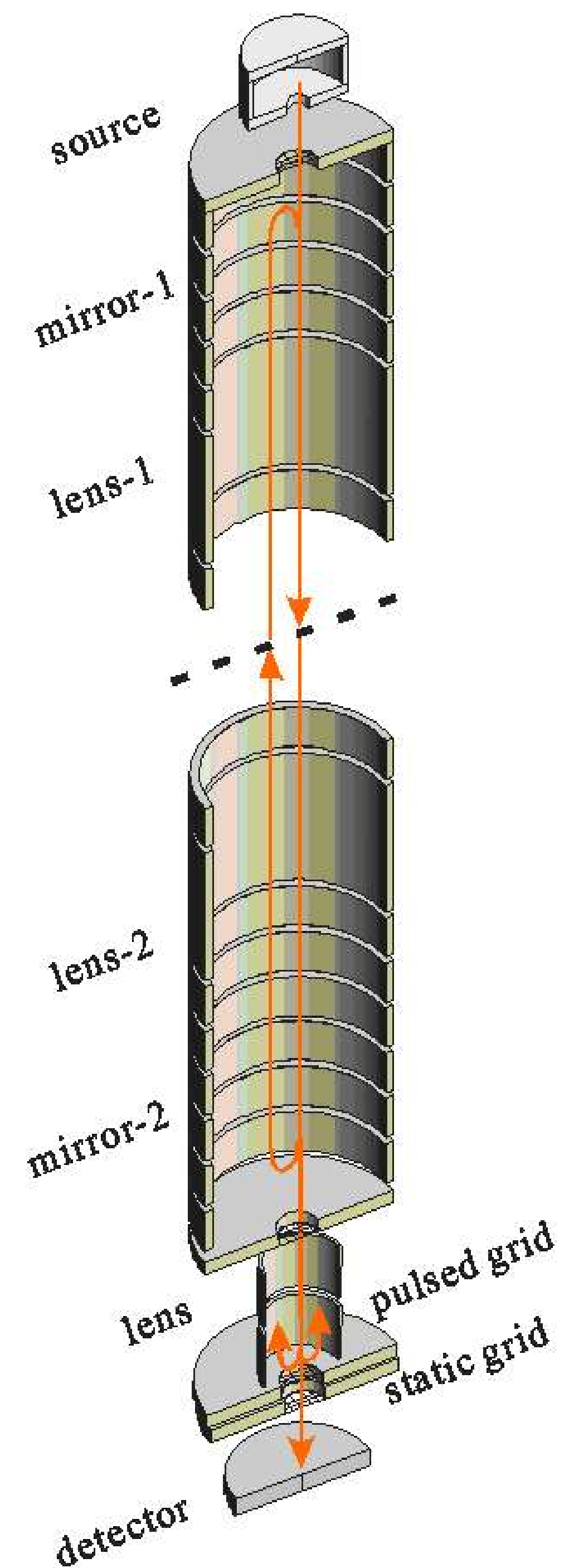
Purpose: develop a new computer program for electrostatic field calculations and ion-optics simulations



Introduction:

The new ion-optics simulation program, required to design the MtoF separator, should have the following properties:

- Consolidation of previously coded FORTRAN routines with a Graphical User Interface (GUI)
- Calculate axially symmetric electrostatic field
- Trace ions in the calculated field by numerical integration
- Produce graphic and file output for electrode geometry, electrostatic field and ray tracing results
- Calculate and optimize ion-optical properties of the system

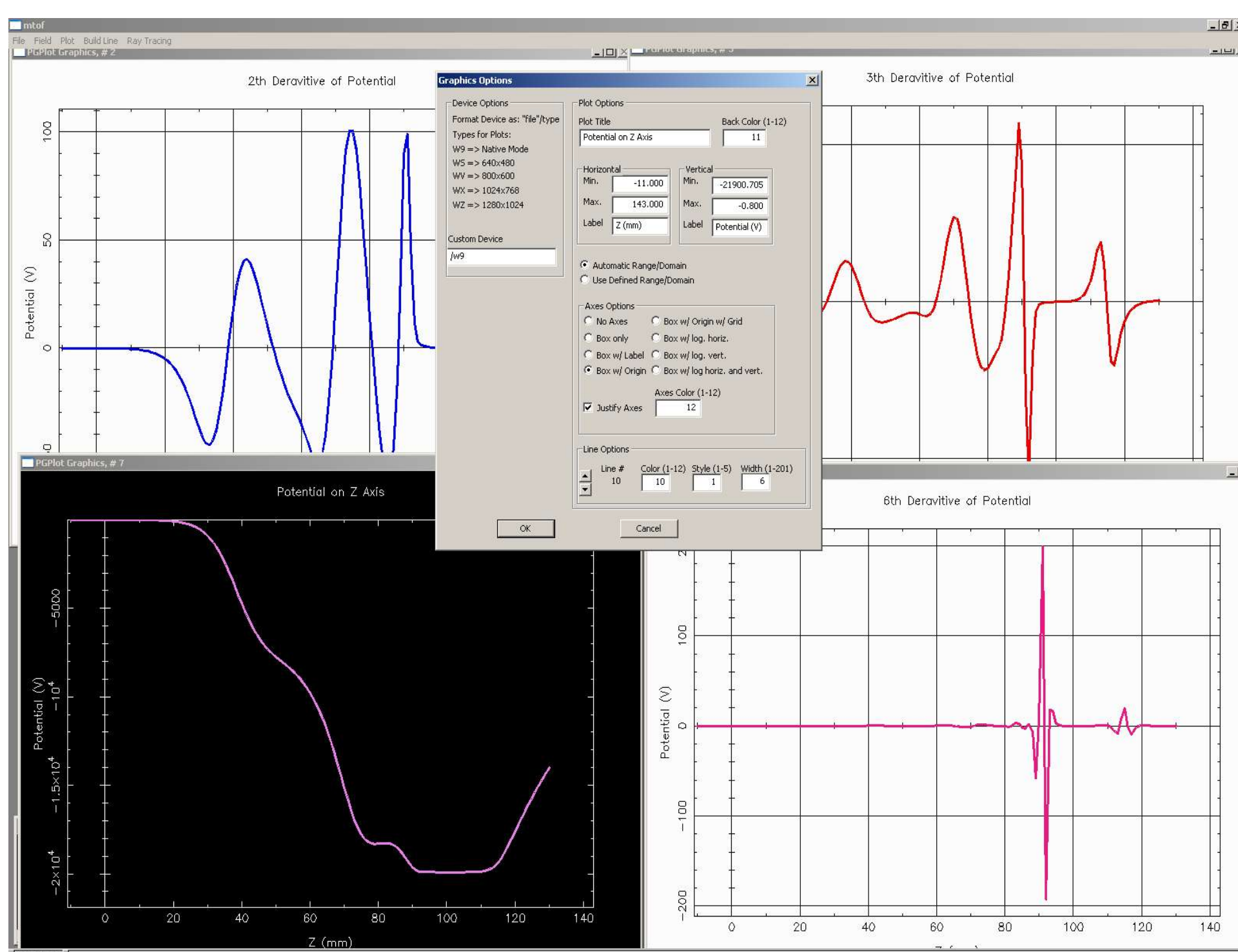


Completed Work:

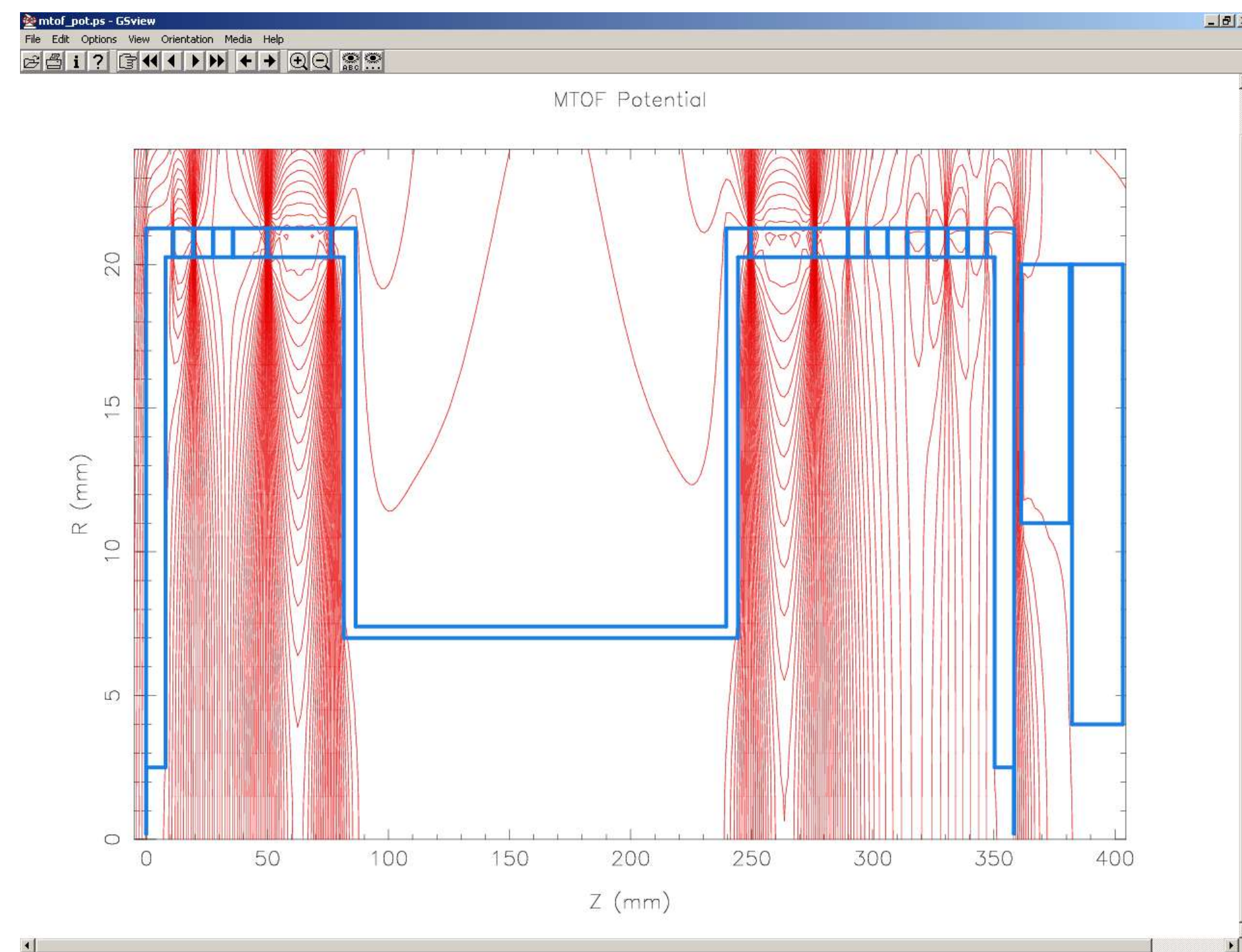
• The program can do the following types of calculations:

- 1) Charge Density (Boundary-Element) method used for electrostatic potential calculation both on and off axis
- 2) Fast reconstruction of the potential in a volume from its on-axis values to speed up ray tracing and optimization
- 3) Full (more precise for complex geometries) SIMION compatible potential calculation
- 4) Ray Tracing particles through ion-optical system using Runge-Kutta integration
- 5) All calculations with variable sized intervals

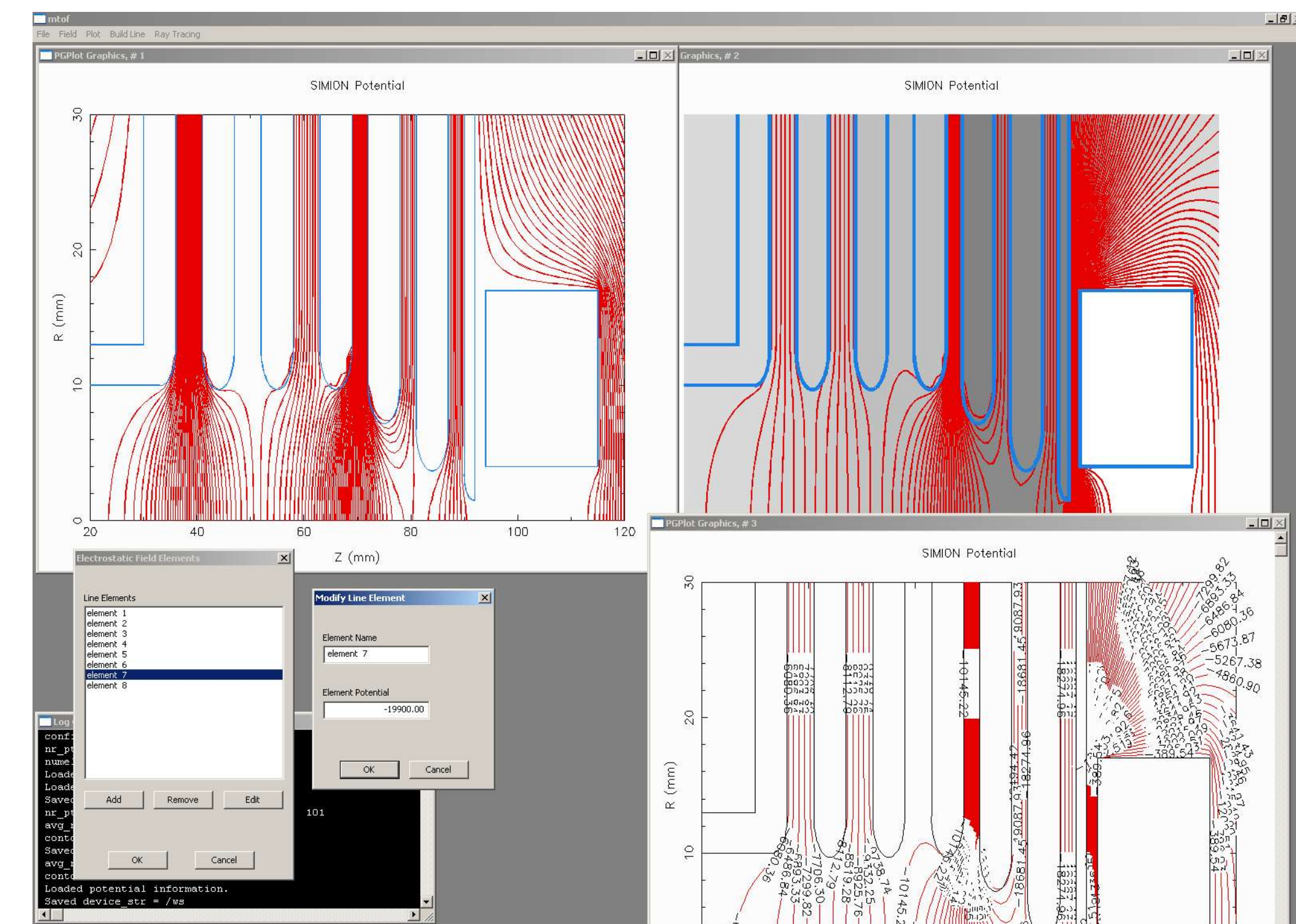
• GUI allows user to easily define parameters of calculations and plots



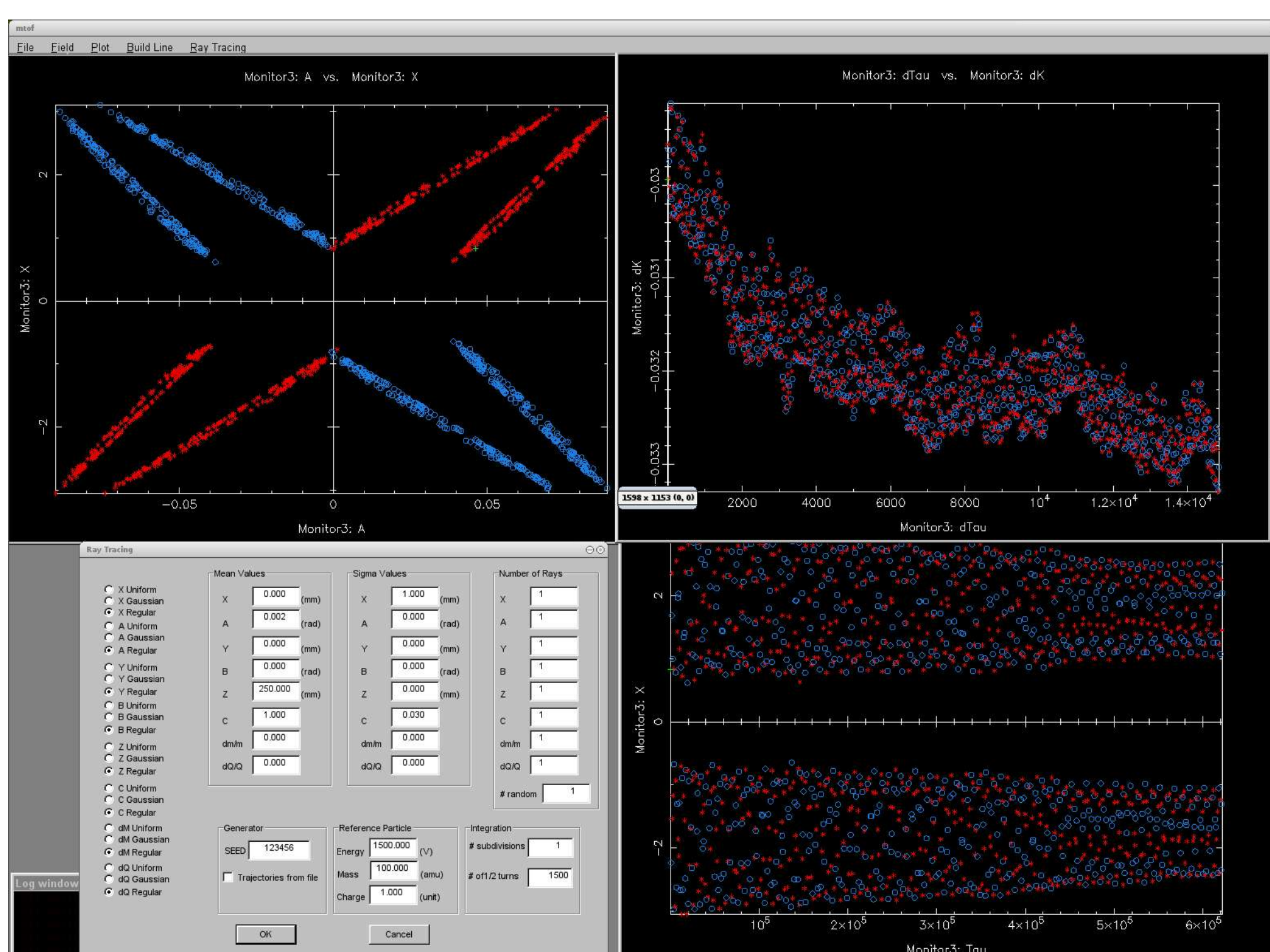
Potential and derivatives on axis



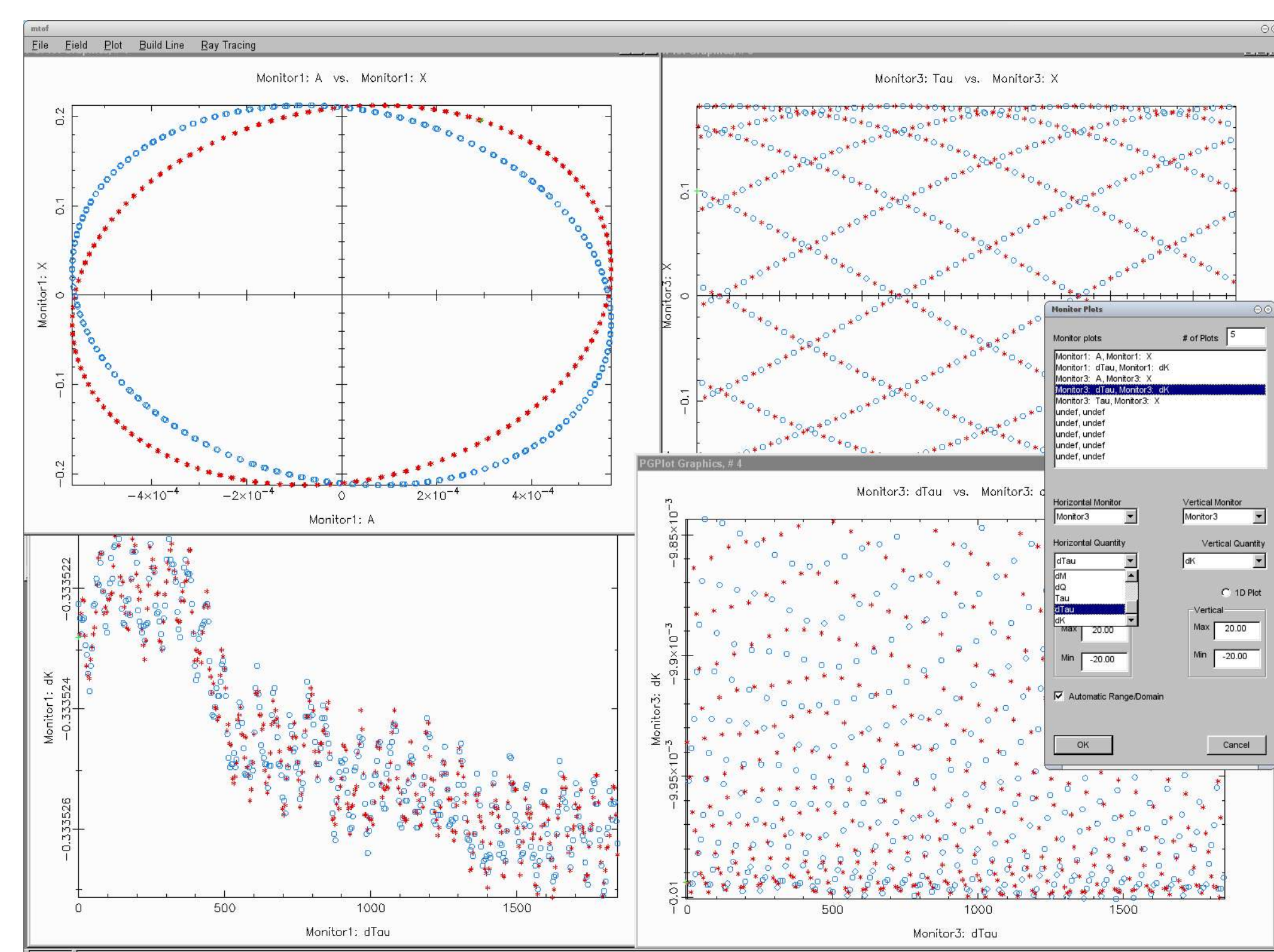
MtoF electrode geometry & potential



Potential off axis contour mapping



Phase plots and parameters used



Phase plots and monitor plot dialog

- File I/O includes:
 - 1) Electrode and line definition files used as system input specification, GIOS compatible
 - 2) Potential on and off axis stored in ASCII files
 - 3) Electrode response functions saved to binary files
 - 4) Saving and loading of SIMION PA files
 - 5) Save plots as PostScript, GIF, LaTeX

Work To Be Completed:

- Ion trajectory and phase space ion distribution plots (partial completion)
- Optimization of ion-optical parameters (minimization of ToF optical aberrations)
- GUI and file I/O modifications related to these tasks
- Implementation of optical elements like: quadrupoles, octupoles, time dependant elements/fields