Pseudo Potential Tutorial

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Jan 8, 2020

This tutorial is intended to provide a brief explanation on how the corresponding Matlab codes work to generate plots of pseudo-potentials and more.

1 Import Data

Import data from one of the following options:

1.1 Import Data with .mat File

The .mat file is located at `Generated Data/results.mat`. The .mat file contains three variables:

- `resultsL0`: The calculated data for the original setup with middle electrode length $L_0 = 16.764$ mm.
- `results0_5L0`: The calculated data for the setup with middle electrode length $0.5L_0 = 8.382$ mm.
- `results2L0`: The calculated data for the setup with middle electrode length $2L_0 = 33.528$ mm.

Note. Each calculate data is a 1×3 cell storing the calculated fields, the STL file path, and the middle electrode length.

1.2 Generate Data directly

Run the following commands:

```
resultsL0 = compilePaulFieldsSimple('STLs/Paul_Var_L0.stl'); results0_5L0 =
↪  compilePaulFieldsSimple('STLs/Paul_Var_0.5L0.stl'); results2L0 =
↪  compilePaulFieldsSimple('STLs/Paul_Var_2L0.stl')
```

The calculated fields will be stored into variables `resultsL0`, `results0_5L0`, and `results2L0` respectively.

2 ToolBox

2.1 Calculations

The toolbox is located at `paulLoadingMiscSimple.m`. There are currently seven calculations in this toolbox:

1. Radial Instantaneous Maximum Potential
2. Radial Pseudopotential
3. Axial Pseudopotential
4. Axial DC Potential
5. Radial Secular Frequency
6. Axial Secular Frequency

7. Ion Trajectory Simulation

The calculations can be turned on/off by editing the beginning of `paulLoadingMiscSimple.m`:

```
% **** Function Enabled ****
Radial_Instant = true; % Radial Instantaneous Maximum Potential
Radial_Pseudo = true; % Radial Pseudopotential
Axial_Pseudo = true; % Axial Pseudopotential
Axial_DC = true; % Axial DC Potential
Radial_SecFreq = true; % Radial Secular Frequency
Axial_SecFreq = true; % Axial Secular Frequency
Ion_Sim = true; % Ion Trajectory Simulation
% *************************
```

2.2 Using the Toolbox

The toolbox should be called as following:

```
paulLoadingMiscSimple(results)
```

where `results` is one of the calculated data variables in the previous section. For example, to use the toolbox on the setup with middle electrode length $0.5L_0 = 8.382$ mm, one should call

```
paulLoadingMiscSimple(results0_5L0);
```

Note. When the tool box is run for several times, some figures (in calculations 1-4, 7) will display the data for multiple runs as `hold on` is added in the plotting codes. You may wish to clear or close the figures before having a fresh run of the toolbox.