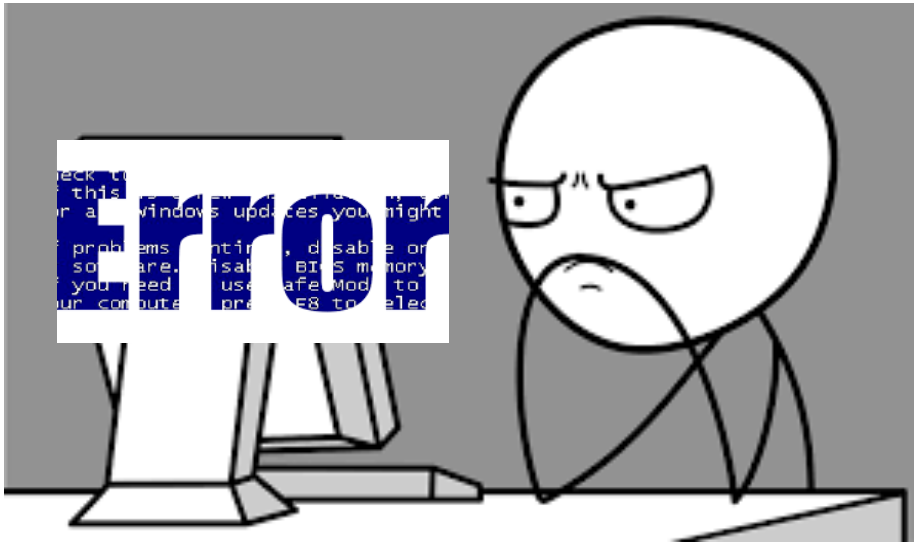
Troubleshooting & Gotchas



Common Issues

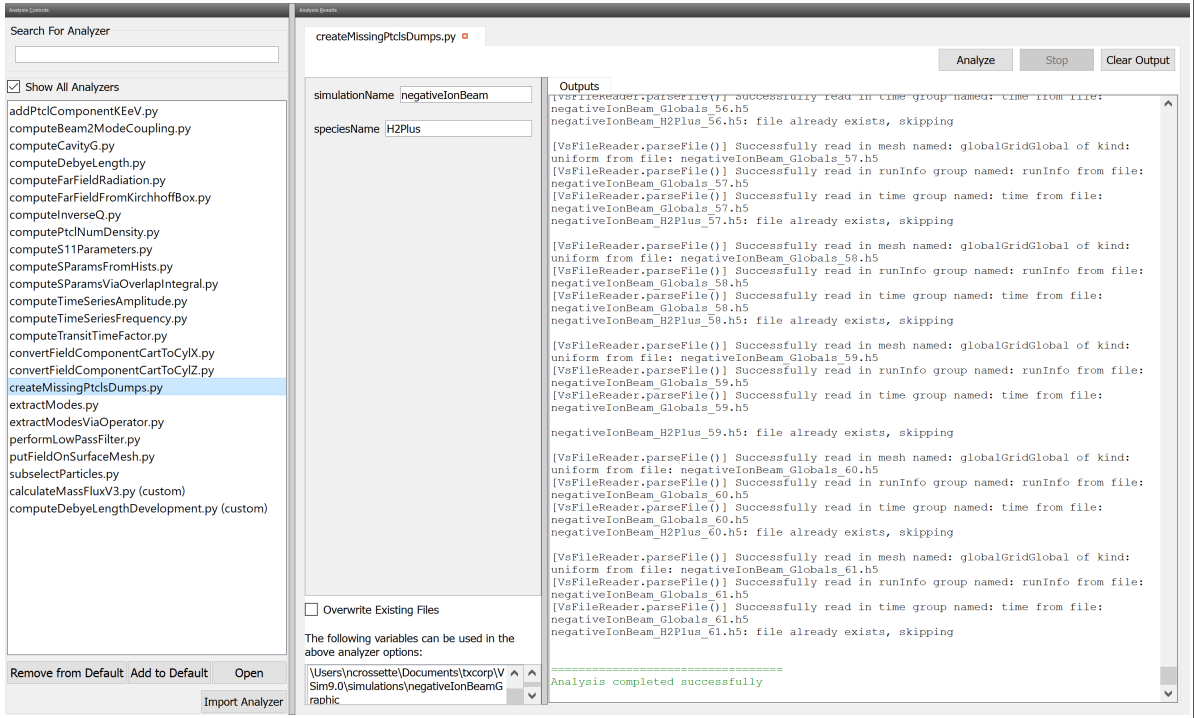
- Forgetting to set a material to a shape/geometry
- Avoid underscores in naming files (especially imported .stls)
- Avoid dashes (-) in object names (like boundary conditions, histories, particle species)
- Duplicate Naming (don't do it)

- Particle related crash (check guard cells, wrong bounds on sinks)
- Virtual Cathode: emitting too many particles $\frac{I}{V^{\frac{3}{2}}} < 2 * 10^{-6}$

- ALWAYS RESOLVE SMALLEST FEATURE (debye length, light wavelength, geometrical feature): Fields leaking out of cavities.

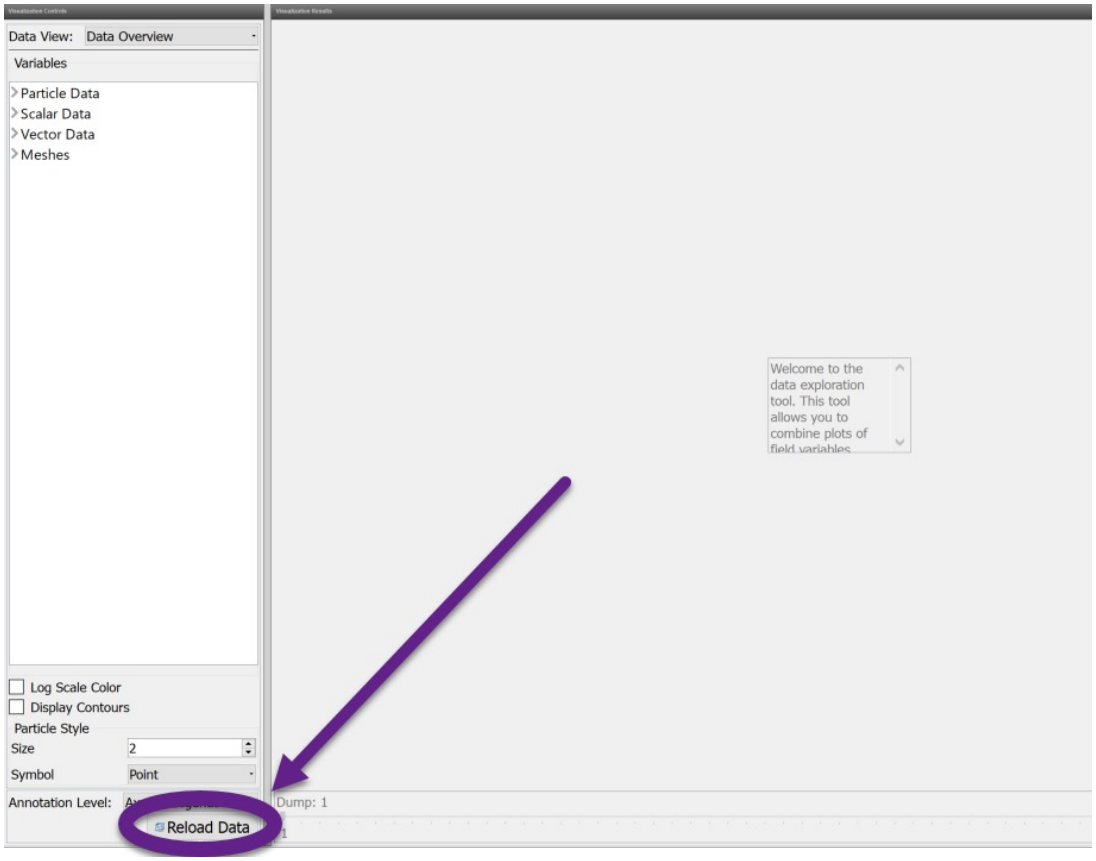
Create Missing Particle Dumps

- **Problem:** I shouldn't see ionization until dump 5, why are there ions at dump 0?
- **Cause:** VSim does not create empty dump files if there are no particles of a particular species. The visualization will plot first particle dump first…
- **Solution:** Run analyzer "createMissingParticleDumps.py" and don't forget to RELOAD DATA!!



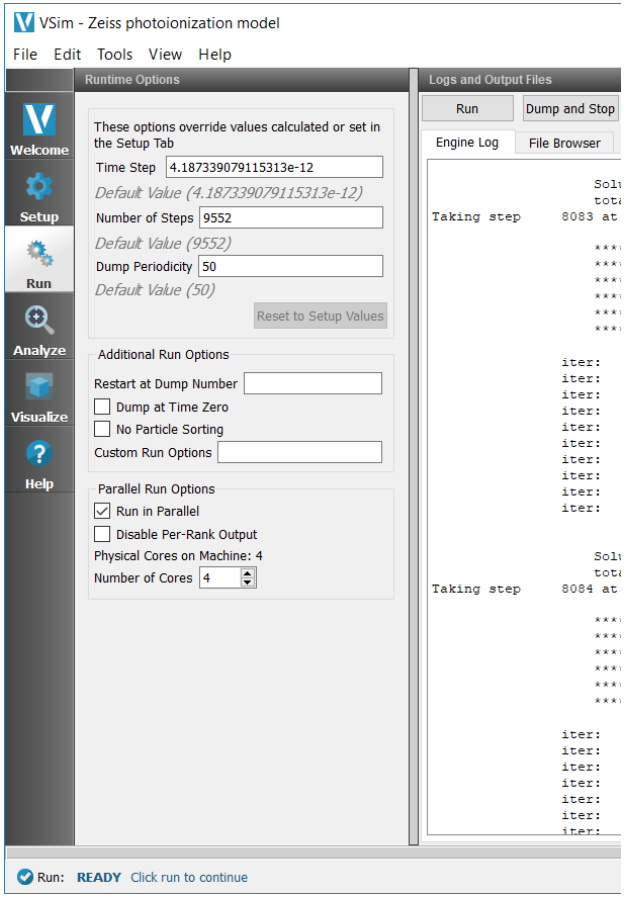
Reload Data

- If new data has been written since your last visit to the Visualize Tab, you must press the “Reload Data” button to see the new data.
- Especially true for after running analyzers,



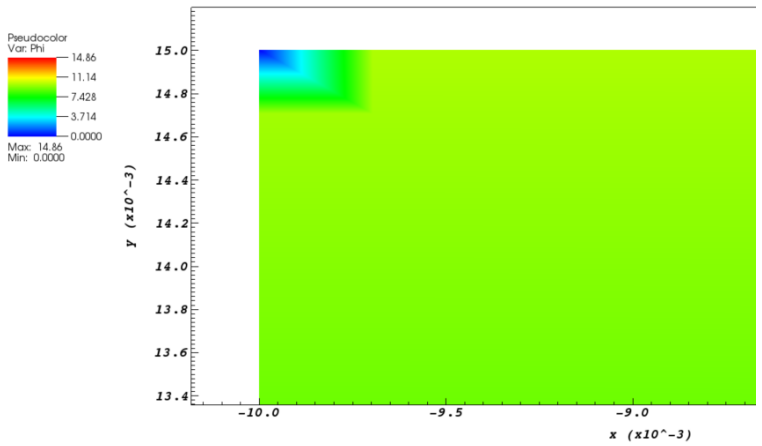
Run Window

- If you set a Time Step/Number of Steps/Dump Periodicity in “Basic Settings” to a constant or parameter, changing the timestep in the Setup tab doesn’t automatically update the RUN values.
- Press “Reset to Setup Values” to update the run values.
- Run tab values are *Persistent*.



For 2019

- Cylindrical loading? Fixed as of VSim 9.0.1?
  - -> In general, to ensure particle loading is being done as expected, use histories
- Boundary conditions at corners. Which takes priority when two slab boundaries meet at a corner.
  - -> Use Partial Boundary conditions

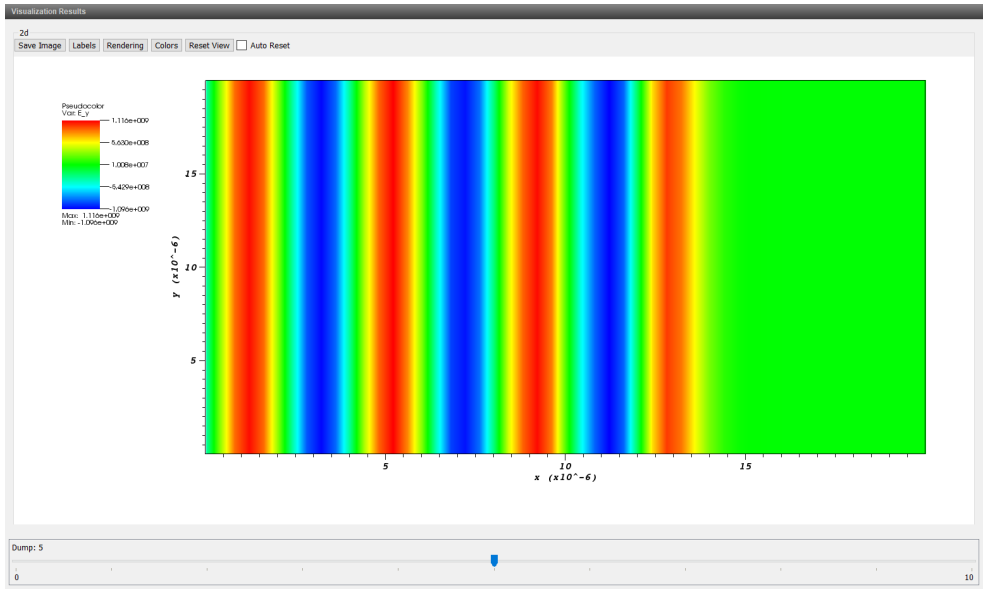


Violating Courant the Condition

```
$ DX = LX/NX
$ DY = LY/NY
$ DZ = LZ/NZ
$ DT = standardTimeStep(1.,TIMESTEP_FACTOR)

$ LAMBDA = LX/WAVELENGTHS
$ FREQUENCY = LIGHTSPEED/LAMBDA
$ OMEGA = 2. * PI * FREQUENCY
```

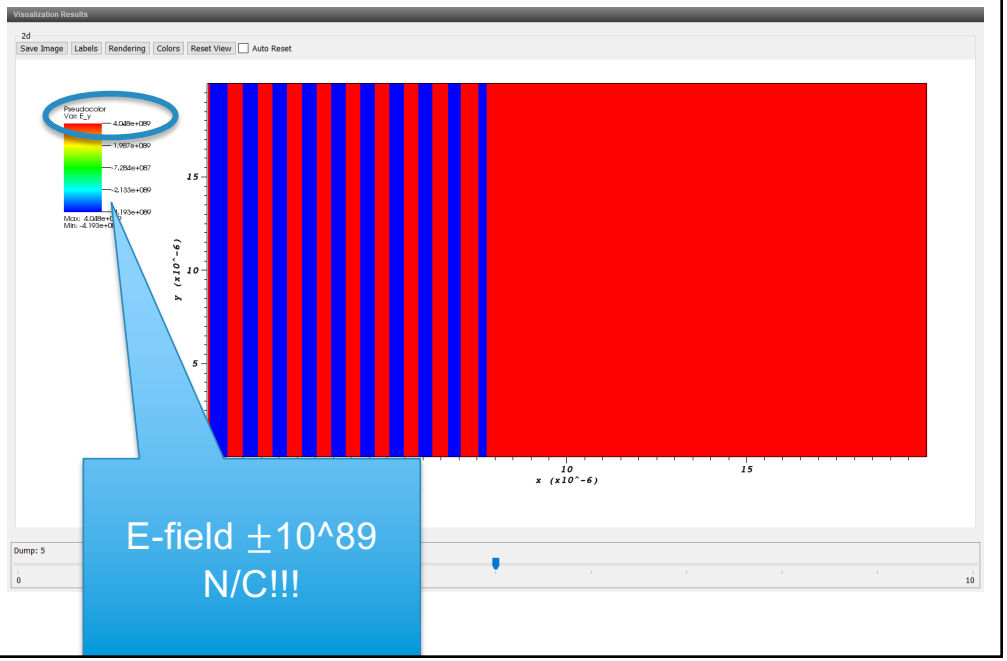
GOOD! $c\ dt < dx$



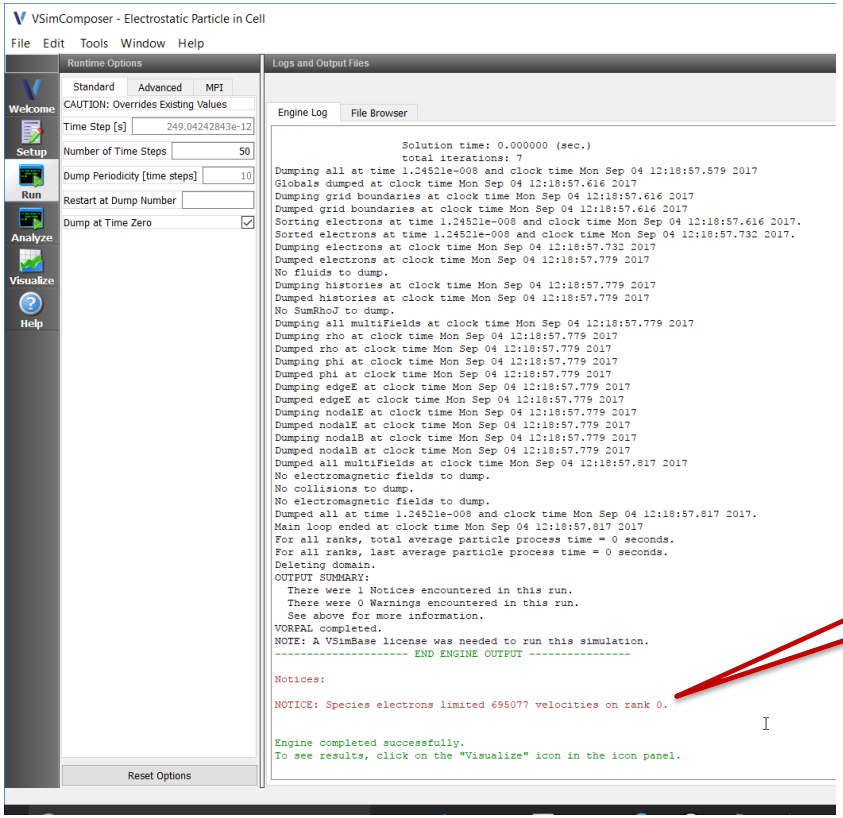

```
$ DX = LX/NX
$ DY = LY/NY
$ DZ = LZ/NZ
$ DT = standardTimeStep(5.0,TIMESTEP_FACTOR)

$ LAMBDA = LX/WAVELENGTHS
$ FREQUENCY = LIGHTSPEED/LAMBDA
$ OMEGA = 2. * PI * FREQUENCY
```

BAD! $c\ dt > dx$

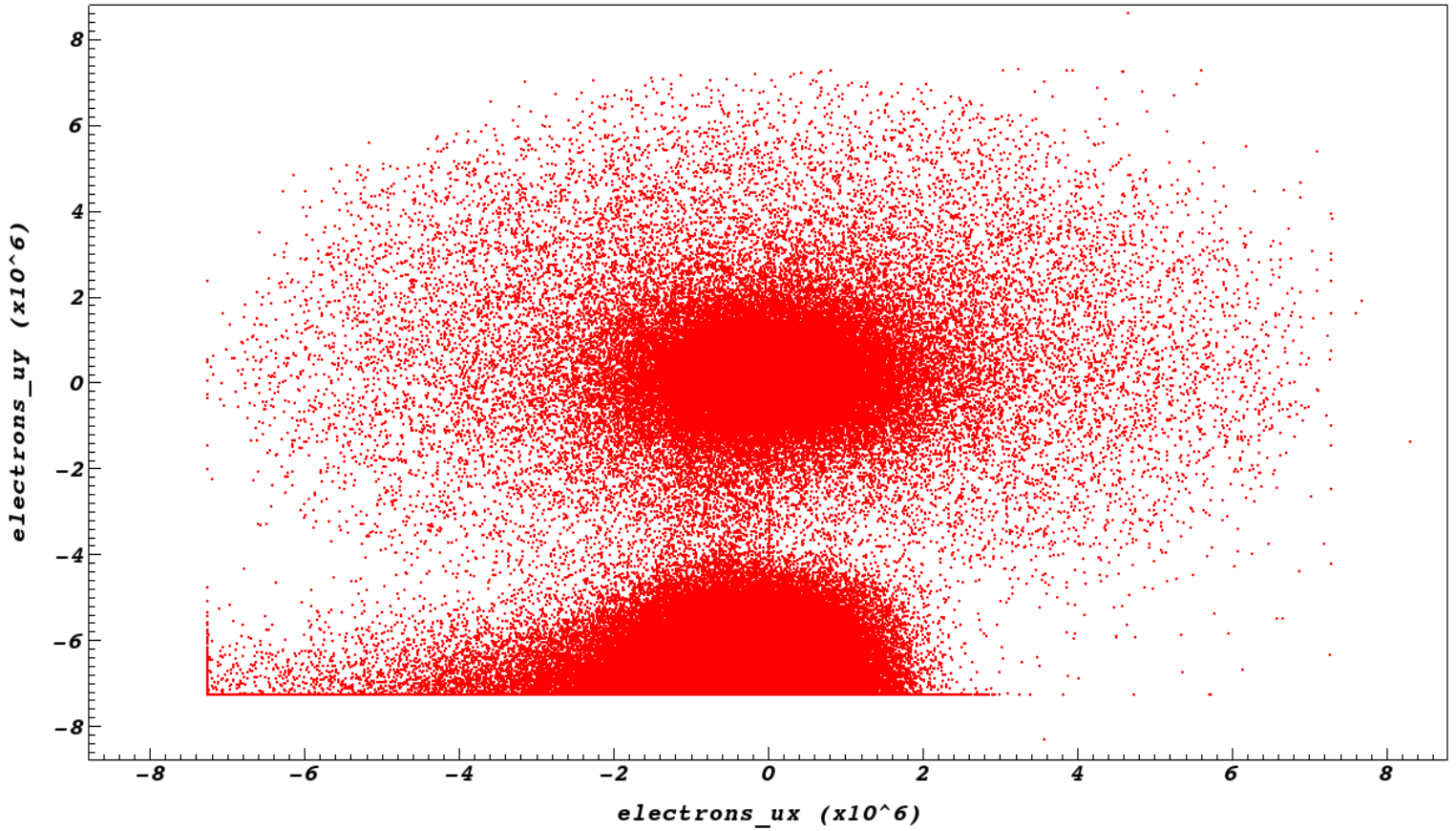


Debye Heating: One sign of grid heating

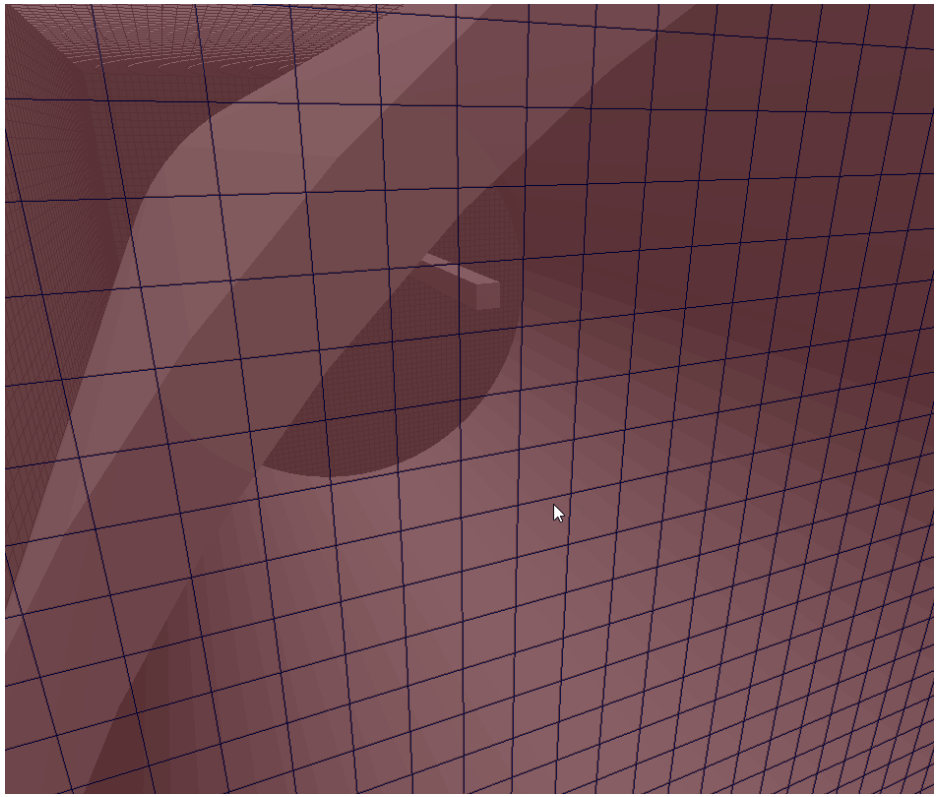


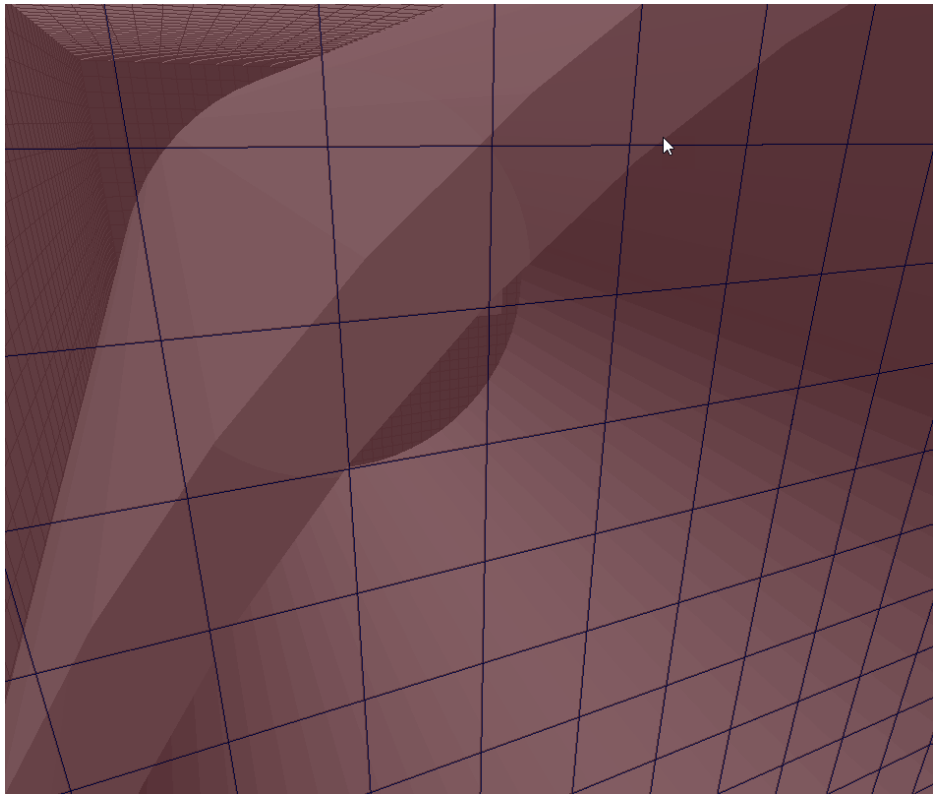
Notice: Species electrons limited ##### velocities

Scatter
Var: electrons_ux,
electrons_uy

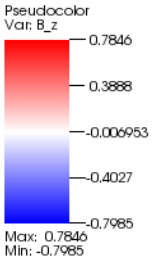


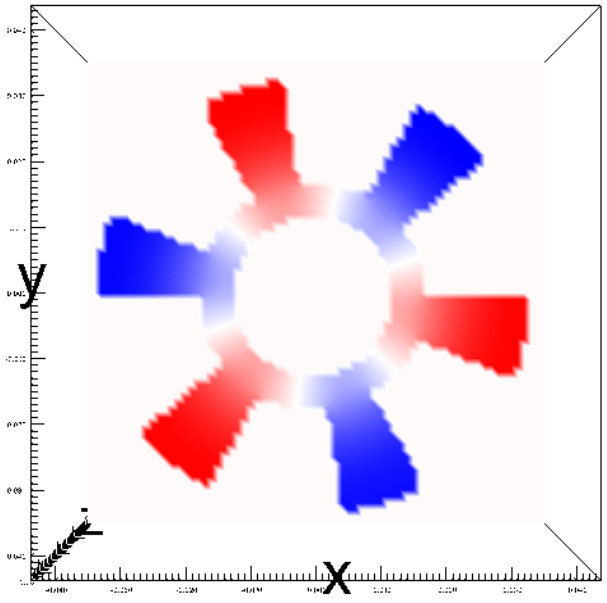
Resolving Smallest Feature

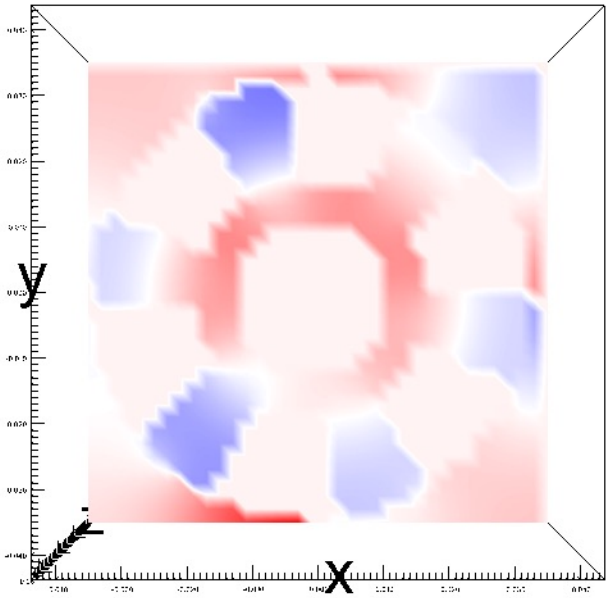




Resolving Smallest Feature



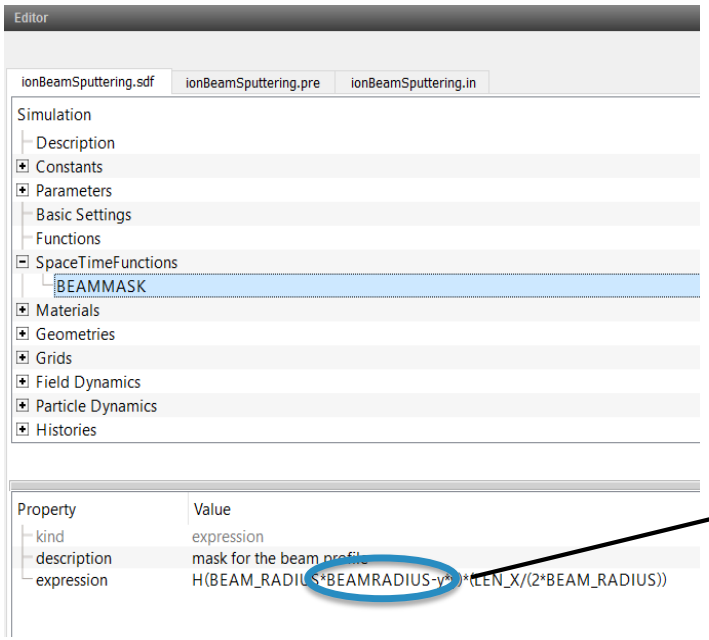


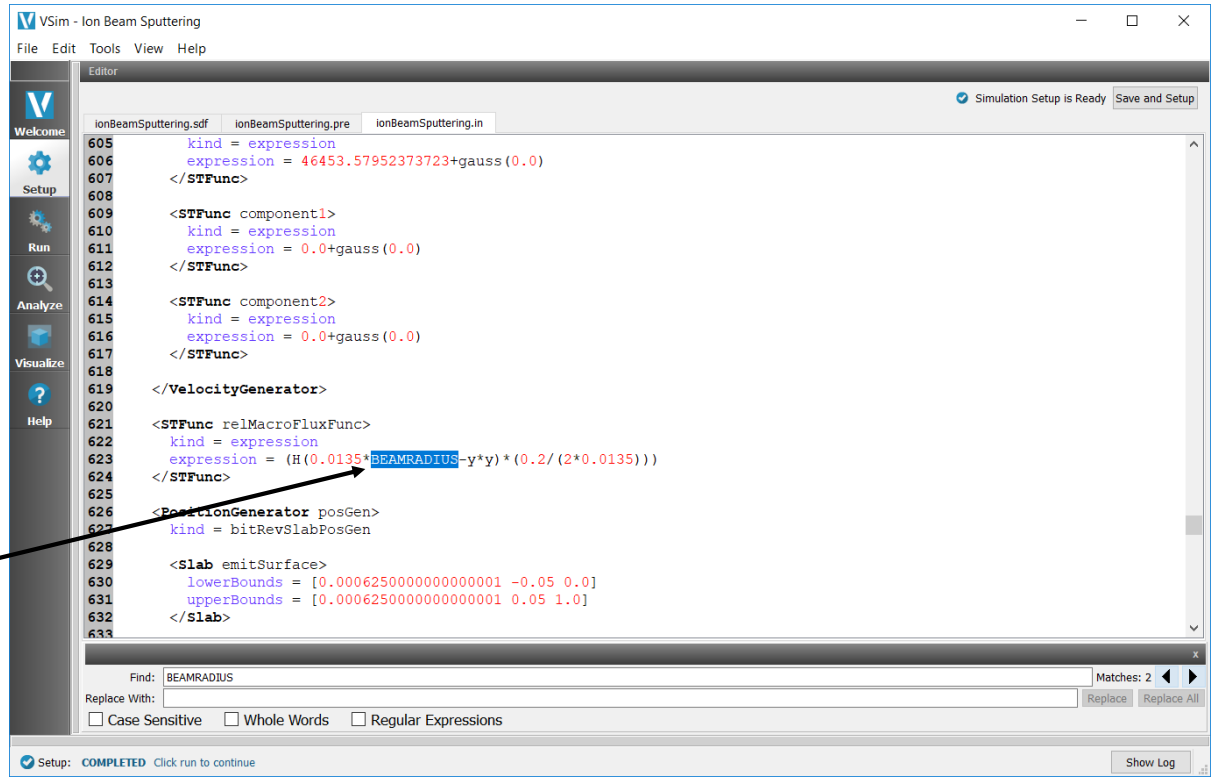


Troubleshooting Tools

- Check the .in file. *Vars.py file (should be fully expanded)
  - unevaluated variables
  - macro/function/logic substitutions
  - $if blocks
- Documentation (available online, from the Help tab, and installed in distribution)
- Run Log
- Verbosity
- Support

Bad .in File


Editor
ionBeamSputtering.sdf
ionBeamSputtering.pre
ionBeamSputtering.in
Simulation
Description
Constants
Parameters
Basic Settings
Functions
SpaceTimeFunctions
BEAMMASK
Materials
Geometries
Grids
Field Dynamics
Particle Dynamics
Histories
Property
Value
kind
expression
description
mask for the beam profile
expression
H(BEAM_RADIUS*BEAMRADIUS-y*y)*(LEN_X/(2*BEAM_RADIUS))


VSim - Ion Beam Sputtering
File Edit Tools View Help
Editor
Simulation Setup is Ready
Save and Setup
Welcome
Setup
Run
Analyze
Visualize
Help
ionBeamSputtering.sdf
ionBeamSputtering.pre
ionBeamSputtering.in
605 kind = expression
606 expression = 46453.57952373723+gauss(0.0)
607 </STFunc>
608
609 <STFunc component1>
610 kind = expression
611 expression = 0.0+gauss(0.0)
612 </STFunc>
613
614 <STFunc component2>
615 kind = expression
616 expression = 0.0+gauss(0.0)
617 </STFunc>
618
619 </VelocityGenerator>
620
621 <STFunc relMacroFluxFunc>
622 kind = expression
623 expression = (H(0.0135*BEAMRADIUS-y*y)*(0.2/(2*0.0135)))
624 </STFunc>
625
626 <PositionGenerator posGen>
627 kind = bitRevSlabPosGen
628
629 <Slab emitSurface>
630 lowerBounds = [0.0006250000000000001 -0.05 0.0]
631 upperBounds = [0.0006250000000000001 0.05 1.0]
632 </Slab>
633
Find: BEAMRADIUS
Matches: 2
Replace With:
Replace
Replace All
Case Sensitive
Whole Words
Regular Expressions
Setup: COMPLETED Click run to continue
Show Log

Documentation

- VSim Documentation has been re-organized for VSim 9
  - Installation
    - Help Getting VSim installed on Linux, Windows, and Mac.
    - Release Notes
  - User Guide
    - The “HOW TO” guide for VSim. Information on workflow for setting up, running, troubleshooting, and visualization.
  - Examples
    - Example simulations demonstrating physics capabilities and simulation setup.
  - Customization
    - How to write your own macros and analysis scripts.
  - Reference
    - Glossary/Encyclopedia of VSim features.

Engine Output: Notices and Warnings

```
OUTPUT SUMMARY:
  There were 2 Notices encountered in this run.
  There were 5 Warnings encountered in this run.
  See above for more information.
VORPAL completed.
NOTE: A VSimPD license was needed to run this simulation.
---------------------- END ENGINE OUTPUT ----------------

Notices:

NOTICE: No mask specified, emitting fromentire slab emitSurface specified in position generator

NOTICE: For position generator, bitRevSlab, ptclsPerCell not specified.  Taking from owning species.


Warnings:

WARNING: Detected overlapping sinks in PtclSinkArray.  Change verbosity to VP_DEBUG to see more information.

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Engine completed successfully.
To see results, click on the "Visualize" icon in the icon panel.
```
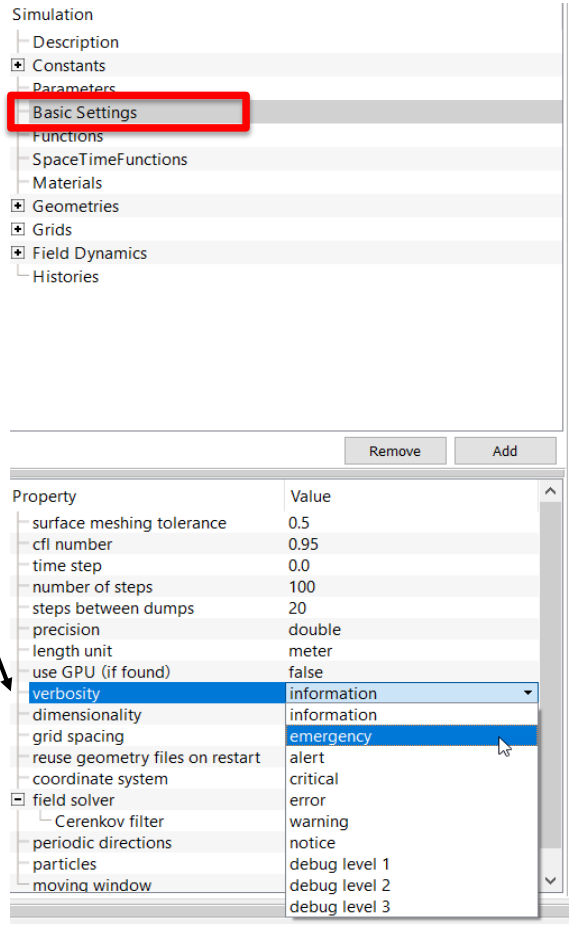

Engine Output: ERRORS (Epetra)

```
DEBUG2: C:\vorpalall-VSIM-8.1\vorpal\vptrol\VpDomain.cpp, line 351, Domain VpDomain::buildMonteCarloHandlers() returning.
ERROR: In setting up simulation:
Problem found setting up MultiField:

Epetra error -1 occurred calling FillComplete() on matrix..

Lines from 'simpleParticleExtraction_NOELCTRODE.pre' processed.
Finished with 'simpleParticleExtraction_NOELCTRODE.pre'.
Error building solvers.

---------------------- END ENGINE OUTPUT ----------------

Engine completed with error: VORPAL INPUT-FILE ERROR (code 5)
```

Lets Look At the Troubleshooting Guide

https://txcorp.com/images/docs/vsim/latest/VSimDocumentation.html

Verbosity




```
147 $ import verbosity
148 $ import mathphys
149 $ import esGridBoundary
150 $ import solverbcs
```

```
200 # General simulation parameters
201 dimension = 3
202 floattype = double
203 dumpPeriodicity = DUMP_PERIOD
204 dt = DT
205 nsteps = NSTEPS
206 verbosity = VP_DEBUG3
```

Verbosity: how wordy would you like VSim's output?

Contacting Support

Email: support@txcorp.com