

# Getting Started with Elegant

**elegant** is an accelerator code that computes beta functions, matrices, orbits, floor coordinates, amplification factors, dynamic aperture, and more. It does 6-D tracking with matrices and/or canonical integrators, and supports a variety of time-dependent elements. It also does optimization (e.g., matching), including optimization of tracking results. It is the principle accelerator code used at APS.

You can go to Fermi-Lab website to download manual or install source:

[http://www.aps.anl.gov/Accelerator\\_Systems\\_Division/Accelerator\\_Operations\\_Physics/software.shtml](http://www.aps.anl.gov/Accelerator_Systems_Division/Accelerator_Operations_Physics/software.shtml)

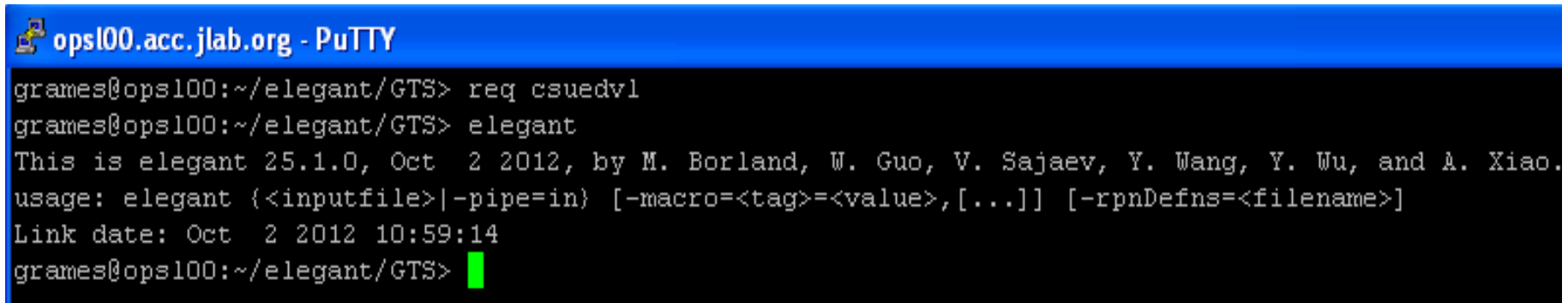
There is also a forum where you can get examples/info and ask questions:

[https://www.aps.anl.gov/Accelerator\\_Systems\\_Division/Accelerator\\_Operations\\_Physics/phpBB3/](https://www.aps.anl.gov/Accelerator_Systems_Division/Accelerator_Operations_Physics/phpBB3/)

# Getting Started with Elegant

To run the current version:

- ✓ You need an accelerator account
- ✓ Use console or PuTTY to *> ssh opsll.acc.jlab.org*
- ✓ To run the current version during shutdown use *> req csuedvl*



```
ops100.acc.jlab.org - PuTTY
grames@ops100:~/elegant/GTS> req csuedvl
grames@ops100:~/elegant/GTS> elegant
This is elegant 25.1.0, Oct  2 2012, by M. Borland, W. Guo, V. Sajaev, Y. Wang, Y. Wu, and A. Xiao.
usage: elegant {<inputfile>|-pipe=in} [-macro=<tag>=<value>,...] [-rpnDefns=<filename>]
Link date: Oct  2 2012 10:59:14
grames@ops100:~/elegant/GTS> █
```

- ✓ Some type of X-forwarding (console, Exceed, NXClient) for editor or graphics
- ✓ A linux text editor, e.g., *> nedit* or *> emacs*

# Getting Started with Elegant

Step 1 – A lattice file (file.lte) is a linear sequence of elements that specifies the Elements and their Sequence.

## ■ Elements

- Specify an element's description (name, geometry, orientation) and what the element does (bend, focus, measure) => *Name: Type, Parameters*
- You can specify as many Elements as you like, even if not used.
- Elements can be externally defined transfer matrices or field maps.

## ■ Sequence

- Specify the order (beam line) of elements => *Name: Line=(Element1, ..., Element-Last)*
- Lines can reference other lines, e.g., *MyBigLine: Line=(SmallLine1, SmallLine2)*

■ Example: */a/itsuser/grames/elegant/GTS/GUN2.lte*

# Getting Started with Elegant

Step 2 – A command file (file.ele) provides Elegant with Setup and Action commands.

- Setup Commands, e.g.

- run\_setup - Specifies global parameters and the input/output files
- optimization\_setup – specifies parameters and methods

- Action Commands, e.g.

- twiss\_output – compute and output Twiss parameters
- floor\_coordinates – computer floor coordinates for your layout
- bunched\_beam – track particle coordinates for beam distributions

- Example: */a/itsuser/grames/elegant/GTS/GUN2.ele*

# Getting Started with Elegant

## Step 3 – Invoke Elegant from the command line or IEE

### ■ Command Line

➤ *> elegant file.ele*

➤ Generates SDDS database files

❑ *> sddsquery file.type*

❑ *> sddsprintout file.type -col=name -col=name*

### ■ Interactive Elegant Explorer (IEE)

➤ *> IEE*

➤ GUI to open, execute and view results all at once

➤ Drop down menus provide details and interactive modification

### ■ Example: Let's try both!

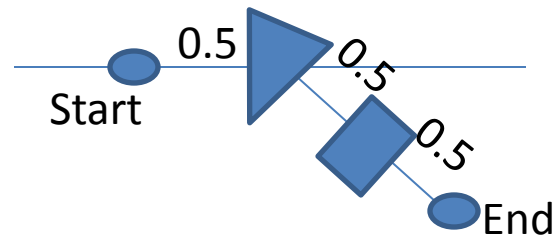
# A Little Take-Home Practice...

## Elegant

- ☐ Download a copy of the Elegant manual.
- ☐ Create your own elegant working directory and copy example files.
- ☐ Try running elegant from the command line and using IEE.
- ☐ Use manual to look up definitions of key-words in GUN2.ele and GUN2.lte.
- ☐ Try the *sddsquery* and *sddsprintout* commands.

## Modeling Cases You Can Try

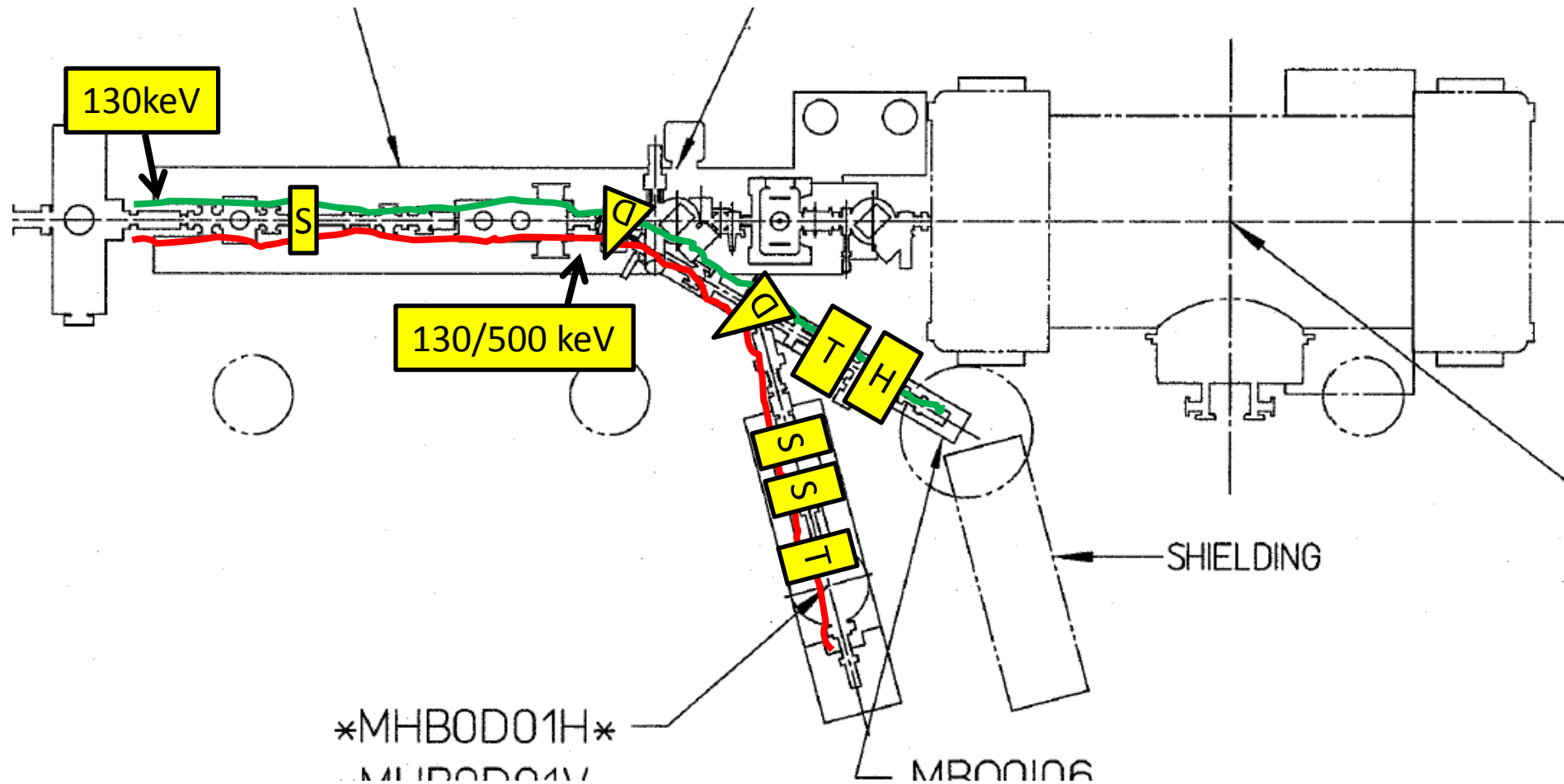
- Using GUN2.ele bunch conditions build a beam line using a 45 dipole magnet (L=10cm, normal faces) and FH-type solenoid to focus 100keV beam to 2mm size (assume center spacing is 0.5m everywhere).



- Reconcile the Elegant manual SOLENOID parameters (L, KS) and the Excel spreadsheet magnet parameters for the “FH” and “FB” magnets at 100keV?

# Beam Line # 1 at CEBAF

Result would be used to prepare and install an experiment this summer.



# Beam Line # 2 at CEBAF

A little more work, but results would be used for two experiments

