

Introduction to ELEGANT

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Command file (*.ele)

- ❑ Built up of “modules”, each addressing specific actions.
 - The order of the modules is important (otherwise error messages are sent).
 - Many options per module (default switches are usually ok)
 - Few modules are really needed at the beginning.

&run_setup

```
lattice  = "Ele_Tu_06.lte"  
use_beamline= L0  
output   = %s.out,  
centroid = %s.cen,  
sigma    = %s.sig,  
final    = %s.fin,  
parameters = %s.par,  
magnets  = "%s.mag"  
p_central_mev = 100.
```

&end

&run_control

&end

&bunched_beam

```
bunch           = %s.bun,  
n_particles_per_bunch = 20000,  
emit_nx         = 1.0e-6,  
emit_ny         = 1.0e-6,  
use_twiss_command_values = 1,  
momentum_chirp = 0.    ! at the entrance  
sigma_dp        = 0.1E-5,  
sigma_s         = 0.5E-3,  
!   sigma_s         = 0.002E-3,  
distribution_type[0] = "gaussian","gaussian","gaussian",
```

&end

&track

&end

Lattice file (*.lte)

- Built up “elements”, each with specific parameters.
 - The order of definition of elements is not important, but beamlines must follow all elements they include.
 - Many parameters per element (default values are usually ok for single particle dynamics)
 - Few elements to sketch a linac

```
% 50  sto V_L0_1
% 3.0  sto F_L0_1
% 90  sto P_L0_6

!- Accelerating structure. Max. gain (on-crest phase) is 90deg ---

CAV_1 :  RFCA,  L=1.326,  volt="V_L0_1 1.e6 *",  freq="F_L0_1 1.e9 *",
phase="P_L0_1", &
change_p0=1,  end1_focus=1,  end2_focus=1,  n_kicks=1

L0      :  LINE = ( Q, CAV_1 )
```

Our first bricks

Beam Charge:

```
Q: CHARGE, TOTAL=0.3E-09
```

Drift:

```
D_S1_1 : DRIFT, L= D_S1
```

Quadrupole Magnet (Defocusing):

```
Q_S1_1 : QUAD, L= LQ_S1, K1=-1.1820
```

Dipole Magnet (Rectangular):

```
B_C1_1: CSBEN, L=0.3, ANGLE="B_C1_ANGLE -1 *", &  
      E2="B_C1_ANGLE -1 *"
```

Accelerating Structure (with Wakefield):

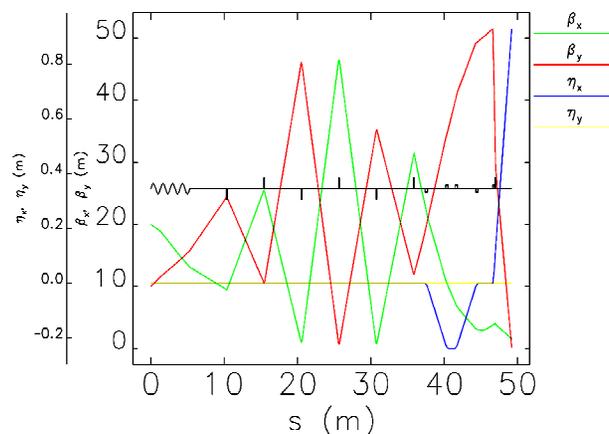
```
CAV_1 : RFCW, L=1.326, &  
volt="V_L0_1 1.e6 *", freq="F_L0_1 1.e9 *", phase="P_L0_1", &  
change_p0=1, end1_focus=1, end2_focus=1, &  
cell_length=33.15e-3, &  
zwakefile="Zwake_S1S7_Trieste_5mm.sdds", tcolumn="t", wzcolumn="W"
```

RF Deflecting Cavity (Vertical):

```
VRFD: rfdf, frequency=3e9, phase=90, voltage="V_VRFD", &  
tilt=1.5707963
```

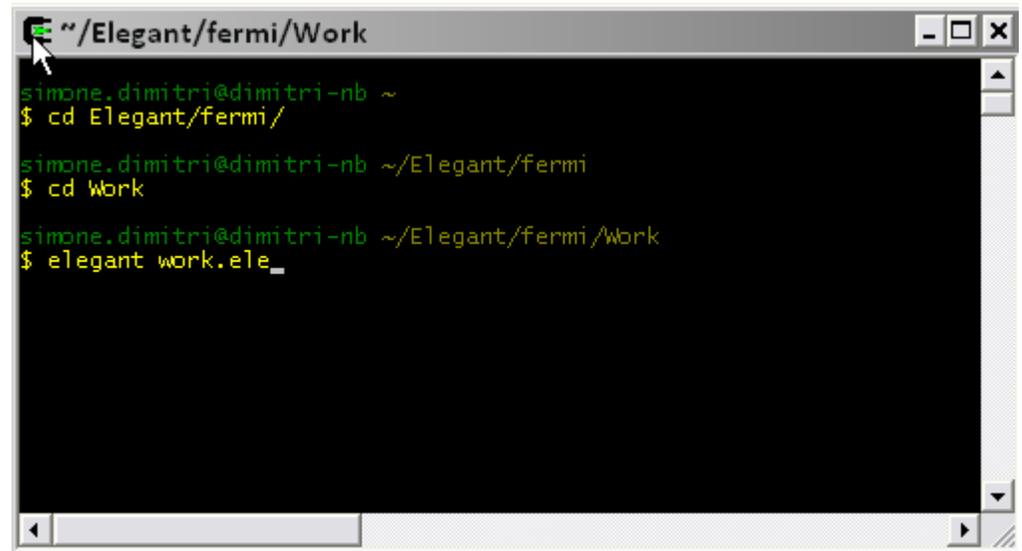
Output Files

- ❑ Most of them specified in the ***.ele** file, **&run_setup** module.
 - You can choose the *rootname.**
- ❑ All are binaries by default, including self-describing head-lines.
 - Self-Describing Data Set (SDDS) format, needs **SDDS-Toolkit** for post-processing.
 - SDDS also for converting output files to *ascii* format.
- ❑ Output data can be manipulated or **plotted** with SDDS command lines or, better, coded in scripts.
 - Many scripts already available in your folder! Built your own by yourself!



How to run

- ❑ ELEGANT and SDDS-Toolkit available both for Linux and Windows.
 - This Course, **Cygwin** Linux-emulator running on Windows.
- ❑ ELEGANT provides info on the files used for run directly onto the shell and in a *.log file.
 - Look to **Warning messages** in the Shell (suggestions on element definitions, settings, and so on). They do not stop the run.
 - **Error messages** in the Shell stop the run. You must fix errors before running again.



```
~/Elegant/fermi/Work
simone.dimitri@dimitri-nb ~
$ cd Elegant/fermi/
simone.dimitri@dimitri-nb ~/Elegant/fermi
$ cd Work
simone.dimitri@dimitri-nb ~/Elegant/fermi/Work
$ elegant work.ele_
```

Website information

Go to website for download and manual:

http://www.aps.anl.gov/Accelerator_Systems_Division/Accelerator_Operations_Physics/manuals/elegant_latest/elegant.html

Manual includes:

[Capabilities of elegant](#)

[Highlights of What's New in Version 25.2.1](#) ← *updates*

[Namelist Command Dictionary](#) ← ***command file (*.ele)***

[Element Dictionary](#) ← ***lattice file (*.lte)***

[Specialized Tools for Use with elegant](#) ← *other codes interface, post-processing, scripts...*

[The rpn Calculator \(«1 1 +»\)](#)

[Examples](#) ← *very instructive!*

[Bibliography](#)

Forum

Go to website and register:

https://www.aps.anl.gov/Accelerator_Systems_Division/Accelerator_Operations_Physics/phpBB3/

phpBB® **Elegant users forum**
creating communities An interactive site to request and provide help for elegant

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 Ring Tracking			

- Q&A grouped by topic
- Prompt answer by authors (and users forum)
- Many tricks and details are not in the Manual