LA-UR-23-30433

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Title:	New Plotter Built into MCNP
Author(s):	Frederick, Cole Spencer
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New Plotter built into MCNP

Presented by Cole Frederick

Work by Sriram Swaminarayan

MCNP User Symposium
Sep 2023

NNSA
National Nuclear Security Administration

Managed by Triad National Security, LLC for the U.S. Department of Energy's NNSA

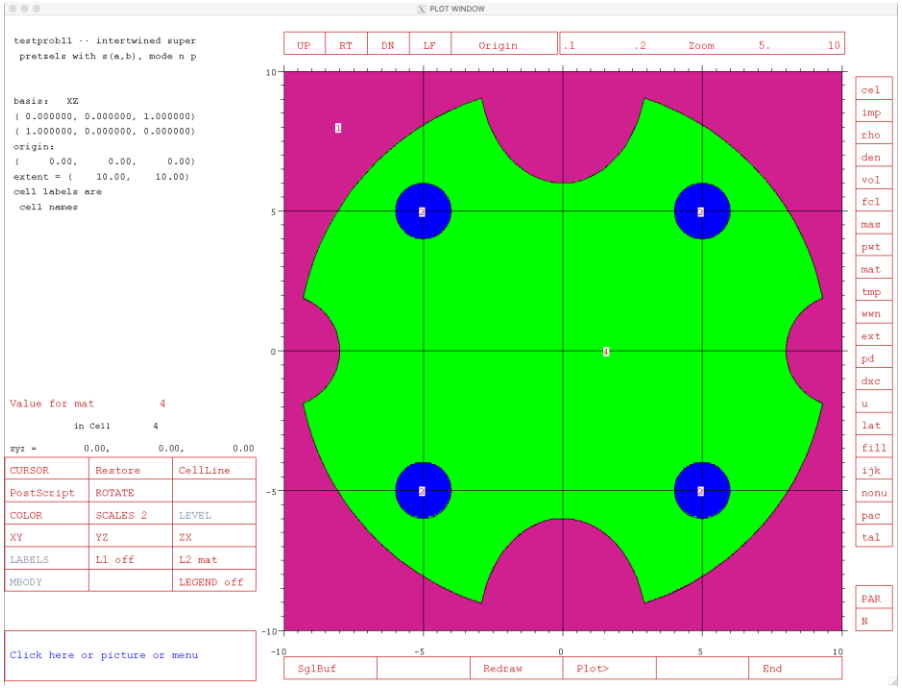
Why update the plotter?

Current interface uses a basic layout

- Buttons are modeled directly in MCNP, not using a UI framework
- Interaction with interface doesn't provide a modern look-and-feel

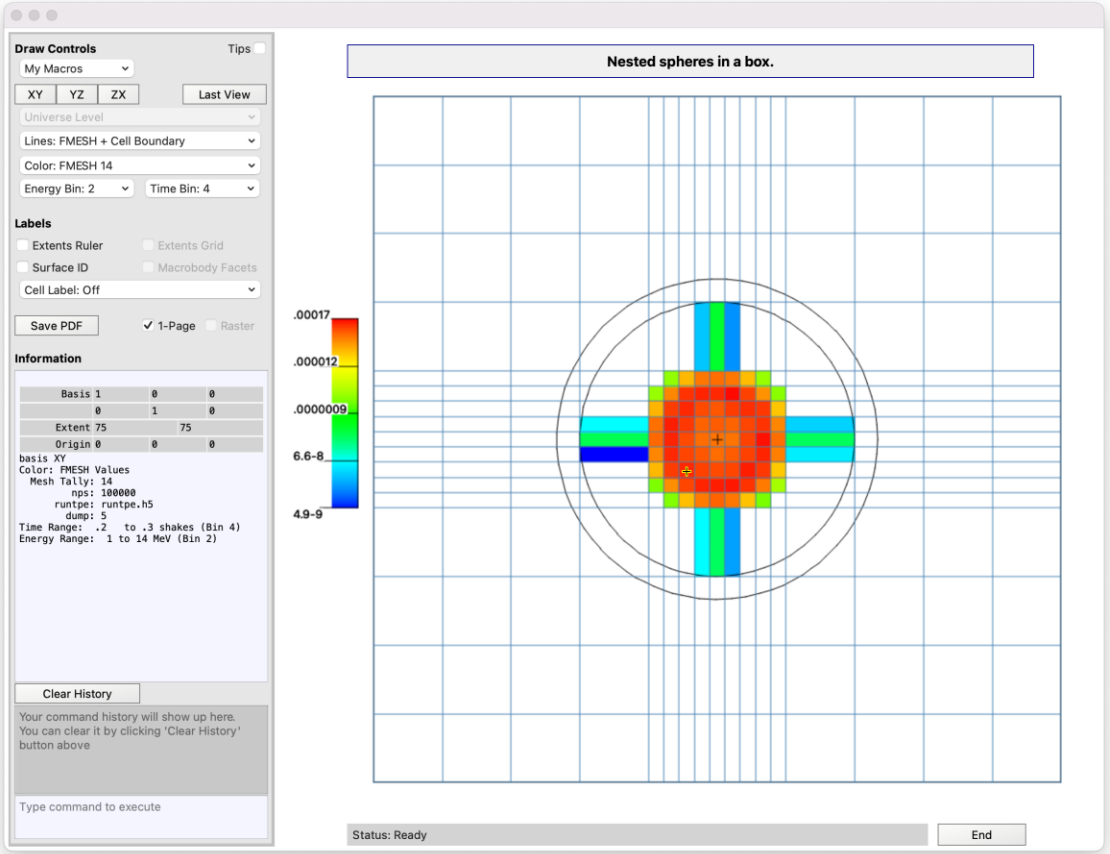
Performance is less than optimal

- No platform specific optimizations
- Host code runs the main event loop



Modern Controls

- Reactive buttons, checkboxes
- Menus (drop down or tear away)
- Tool tips on mouse hover
- Mouse controls for pan, rotate, zoom
- Faster rendering



Features

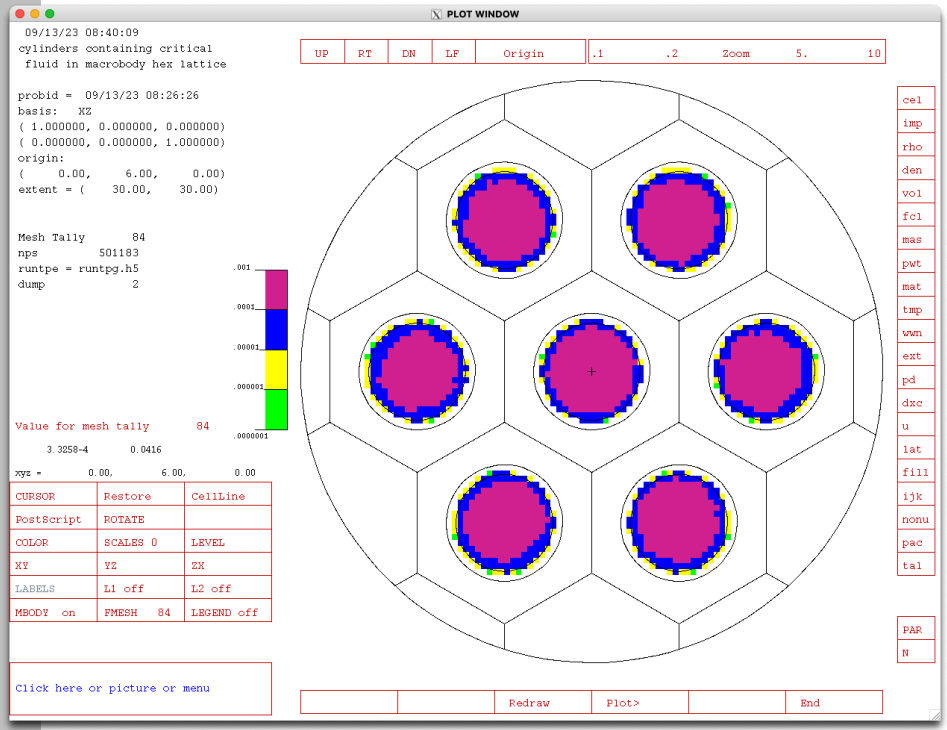
Retains:

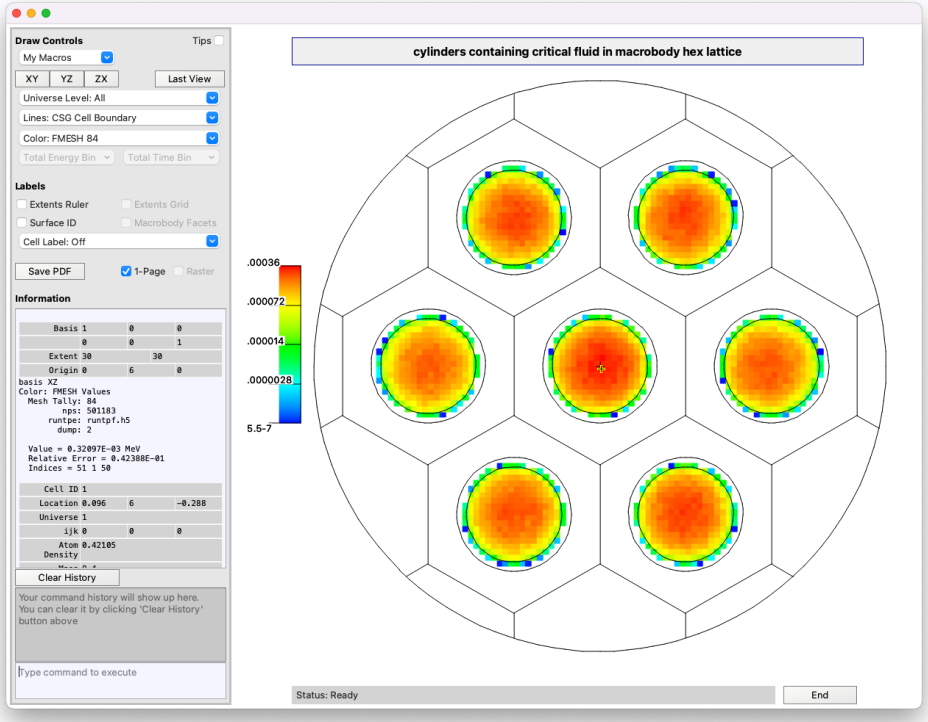
- Text command interface for scripts and power users
- All drawing capabilities offered by previous plotter

Adds (so far):

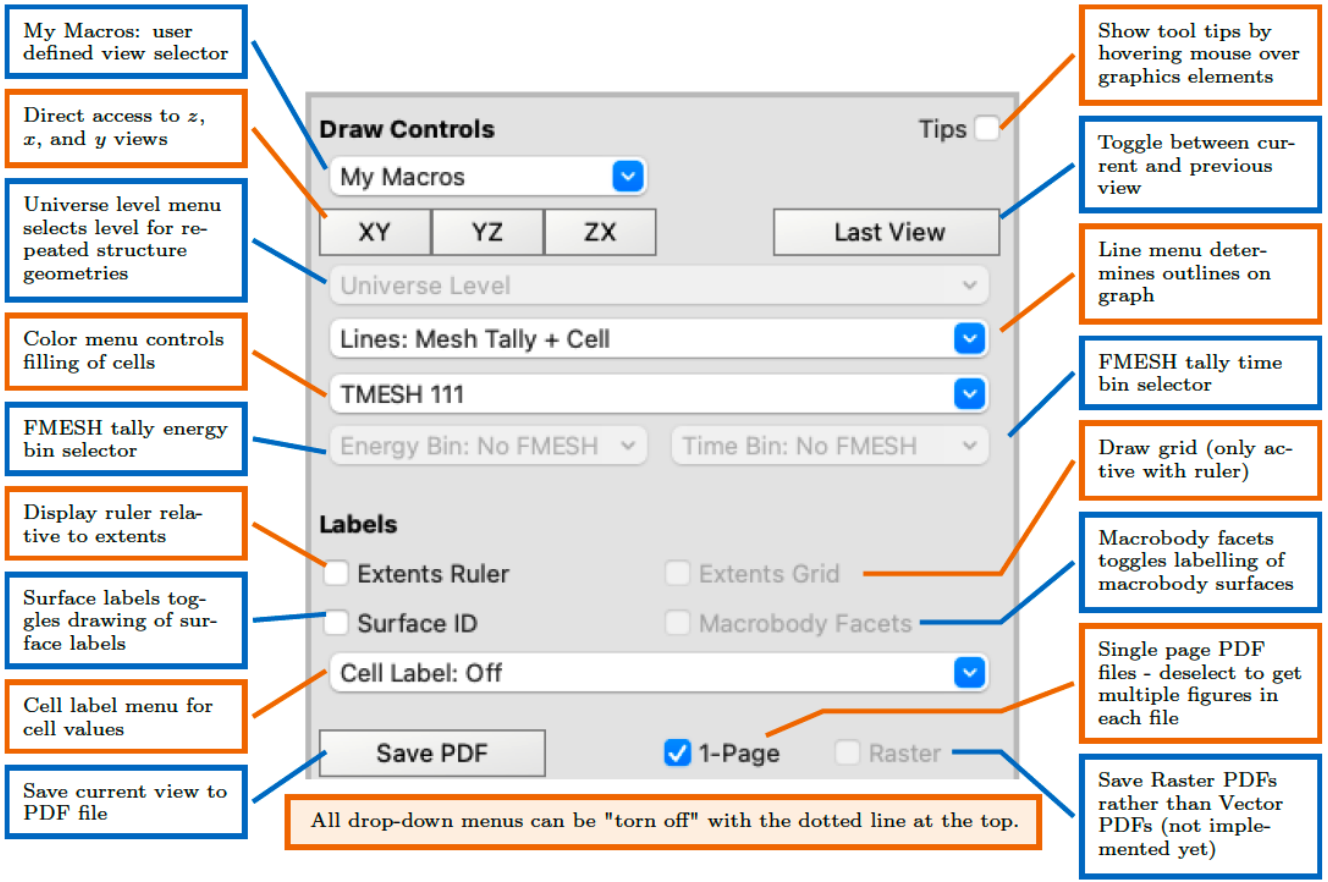
- Export directly to PDF
- Cell information at a glance
- Mouse pan/rotate/zoom
- Save/restore views
  - Easily shared with colleagues
- Etc

Side by Side

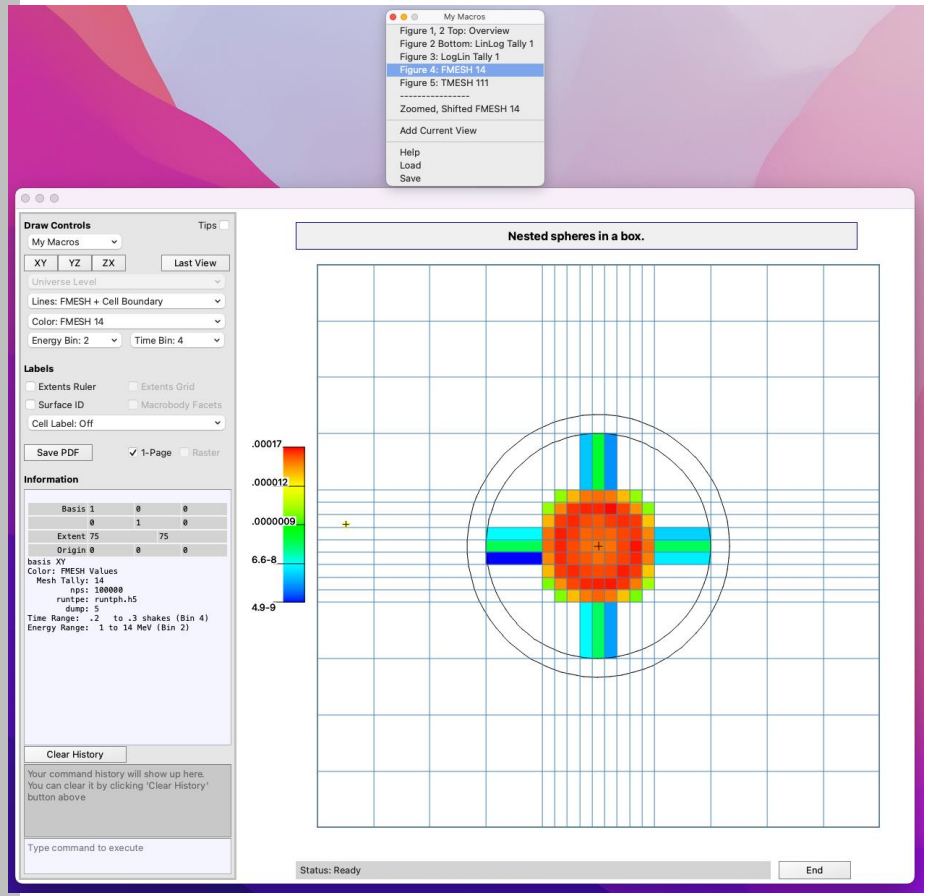

PLOT WINDOW
09/13/23 08:40:09
cylinders containing critical
fluid in macrobody hex lattice
probid = 09/13/23 08:26:26
basis: XZ
(1.000000, 0.000000, 0.000000)
(0.000000, 0.000000, 1.000000)
origin:
(0.00, 6.00, 0.00)
extent = (30.00, 30.00)
Mesh Tally 84
nps 501183
runtpe = runtpg.h5
dump 2
Value for mesh tally 84
3.3258-4 0.0416
xyz = 0.00, 6.00, 0.00
UP
RT
DN
LF
Origin
.1
.2
Zoom
5.
10
cel
imp
rho
den
vol
fcl
mas
pwt
mat
tmp
wwn
ext
pd
dxc
u
lat
fill
ijk
nonu
pac
tal
PAR
N
CURSOR
Restore
CellLine
PostScript
ROTATE
COLOR
SCALES 0
LEVEL
XY
YZ
ZX
LABELS
L1 off
L2 off
MBODY on
FMESH 84
LEGEND off
Click here or picture or menu
Redraw
Plot>
End

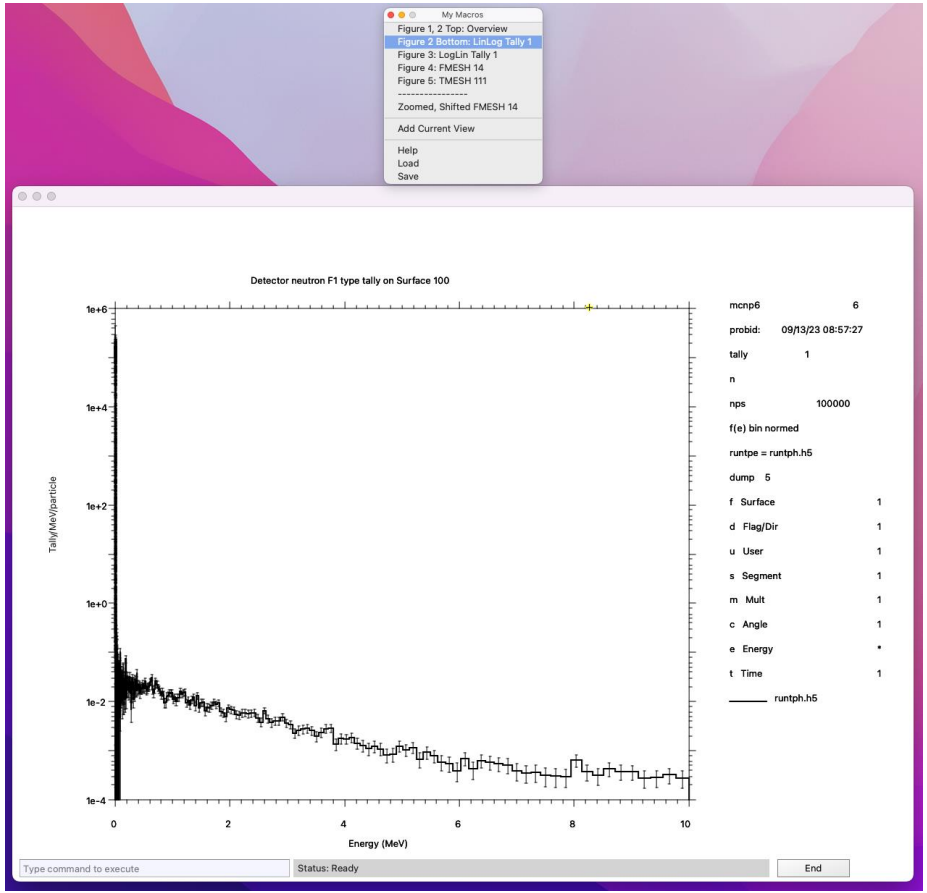

Draw Controls
Tips
My Macros
XY
YZ
ZX
Last View
Universe Level: All
Lines: CSG Cell Boundary
Color: FMESH 84
Total Energy Bin
Total Time Bin
Labels
Extents Ruler
Extents Grid
Surface ID
Macrobody Facets
Cell Label: Off
Save PDF
1-Page
Raster
Information
Basis 1 0 0
0 0 1
Extent 30 30
Origin 0 6 0
basis XZ
Color: FMESH Values
Mesh Tally: 84
nps: 501183
runtpe: runtpf.h5
dump: 2
Value = 0.32097E-03 MeV
Relative Error = 0.42388E-01
Indices = 51 1 50
Cell ID 1
Location 0.096 6 -0.288
Universe 1
ijk 0 0 0
Atom 0.42105
Density
Clear History
Your command history will show up here.
You can clear it by clicking 'Clear History'
button above
Type command to execute
cylinders containing critical fluid in macrobody hex lattice
.00036
.000072
.000014
.0000028
5.5-7
Status: Ready
End

Control Panel Detail



Saved Views


My Macros
Figure 1, 2 Top: Overview
Figure 2 Bottom: LinLog Tally 1
Figure 3: LogLin Tally 1
Figure 4: FMESH 14
Figure 5: TMESH 111
Zoomed, Shifted FMESH 14
Add Current View
Help
Load
Save
Draw Controls
Tips
My Macros
XY
YZ
ZX
Last View
Universe Level
Lines: FMESH + Cell Boundary
Color: FMESH 14
Energy Bin: 2
Time Bin: 4
Labels
Extents Ruler
Extents Grid
Surface ID
Macrobody Facets
Cell Label: Off
Save PDF
1-Page
Raster
Information
Basis 1 0 0
0 1 0
Extent 75 75
Origin 0 0 0
basis XY
Color: FMESH Values
Mesh Tally: 14
nps: 100000
runtpe: runtph.h5
dump: 5
Time Range: .2 to .3 shakes (Bin 4)
Energy Range: 1 to 14 MeV (Bin 2)
Clear History
Your command history will show up here.
You can clear it by clicking 'Clear History' button above
Type command to execute
Nested spheres in a box.
.00017
.000012
.0000009
6.6-8
4.9-9
Status: Ready
End


My Macros
Figure 1, 2 Top: Overview
Figure 2 Bottom: LinLog Tally 1
Figure 3: LogLin Tally 1
Figure 4: FMESH 14
Figure 5: TMESH 111
Zoomed, Shifted FMESH 14
Add Current View
Help
Load
Save
Detector neutron F1 type tally on Surface 100
Tally/MeV/particle
1e+6
1e+4
1e+2
1e+0
1e-2
1e-4
0
2
4
6
8
10
Energy (MeV)
mcnp6 6
probid: 09/13/23 08:57:27
tally 1
n
nps 100000
f(e) bin normed
runtpe = runtph.h5
dump 5
f Surface 1
d Flag/Dir 1
u User 1
s Segment 1
m Mult 1
c Angle 1
e Energy *
t Time 1
runtph.h5
Type command to execute
Status: Ready
End

Demo

Looking forward

Distributed with 6.3.0, ready to try today

- Looking for feedback as we prioritize future work

Integrated directly with MCNP, not a sidecar project

- Used by the development team

Planned next steps

- Multiple windows (showing multiple views into the same geometry)
- 3D rendering (ray tracing) directly reflecting the physics engine
- Interactive/live editing of the geometry

Questions?

Email: frederick@lanl.gov