# Solenoid lattice designer (SLD)

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NFMCC Friday Meeting

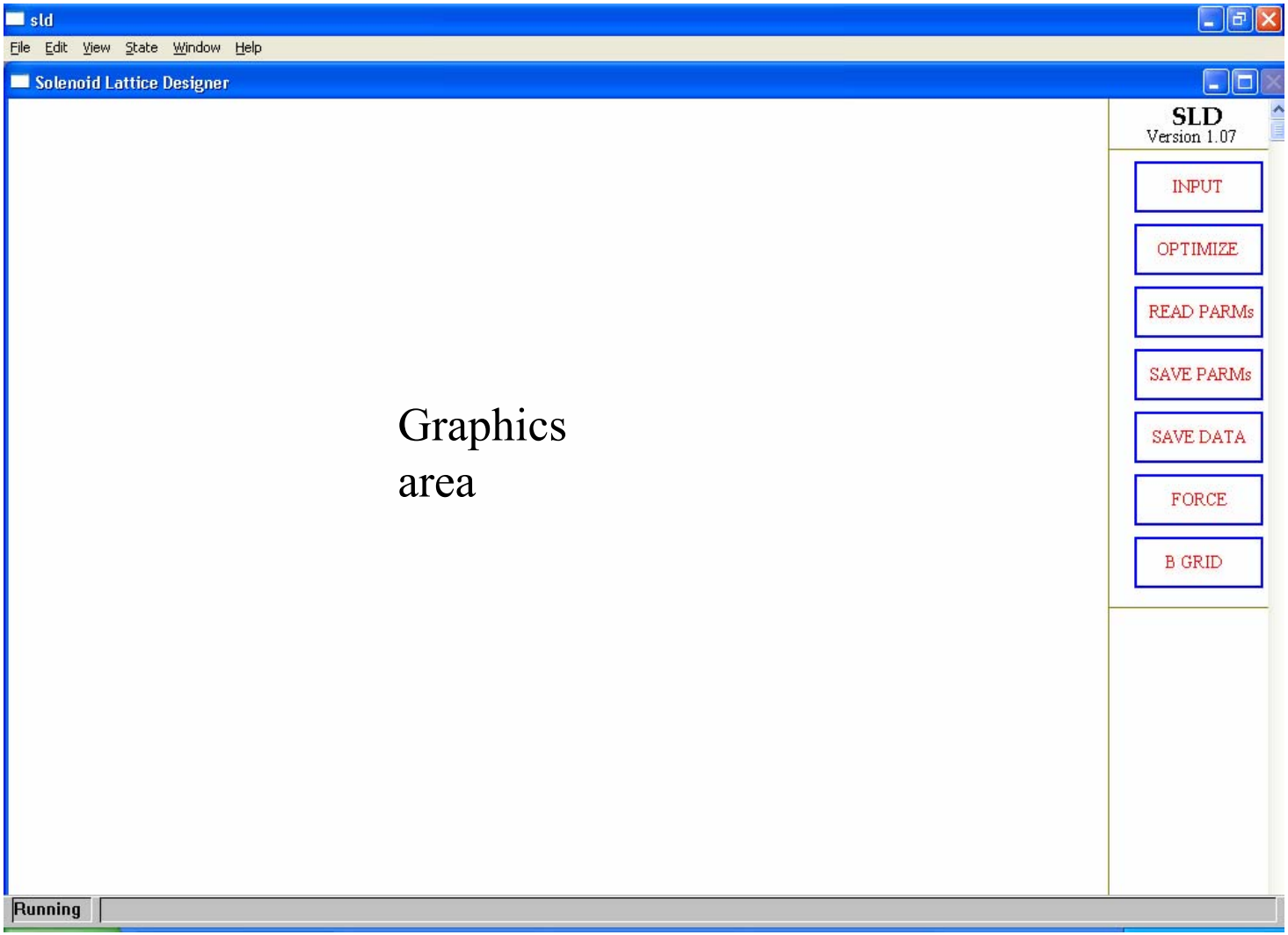
5 October 2007

# Introduction

- developed a number of text-based lattice design tools
- more useful to have integrated graphical design tool
- resulted in new code SLD described here
- gets fields from same elliptic integral routines used by ICOOL
- gets $\beta$ functions from one-cell transport matrix
- uses symplectic integration of on-axis field $\rightarrow$ fast
- checks with sinusoidal fields show good accuracy
- includes engineering information, e.g. peak field, forces, stress
- available at

  http://pubweb.bnl.gov/people/fernow/sld/

# Opening screen

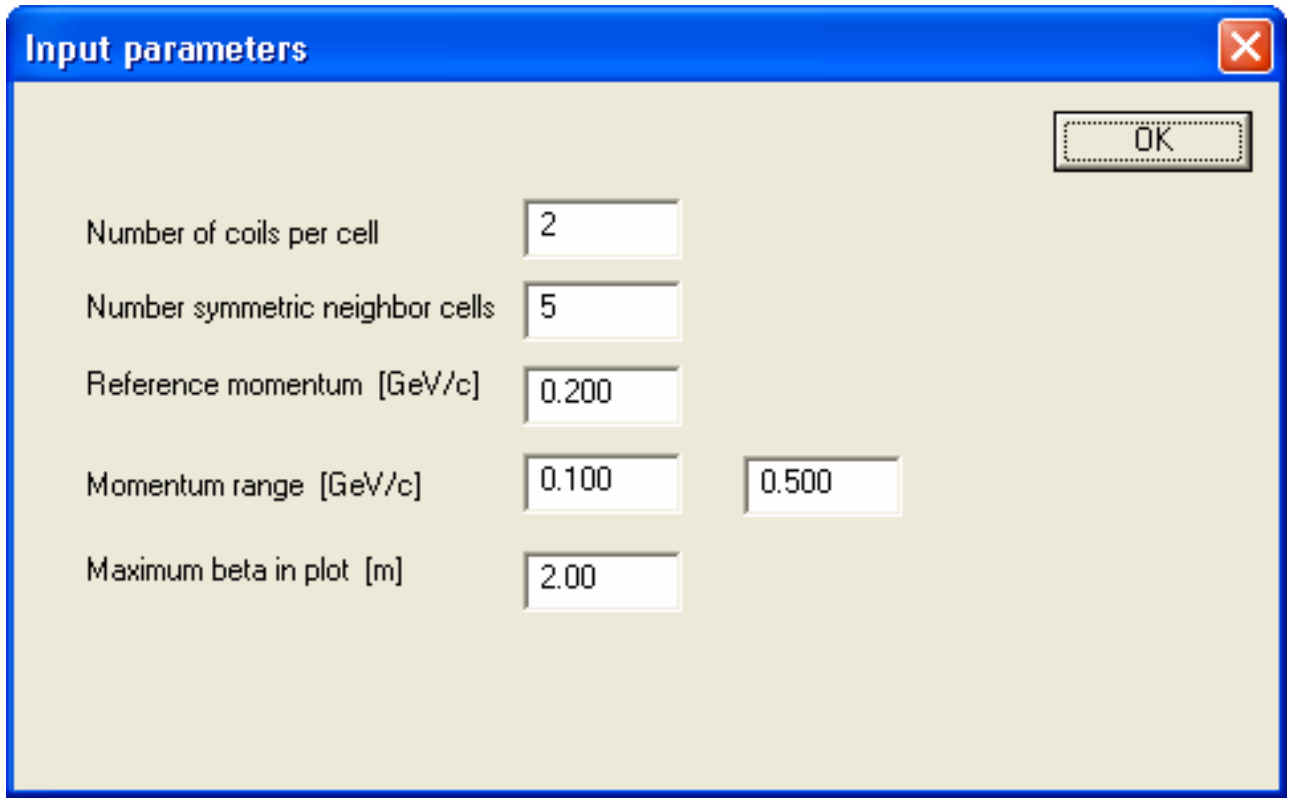



Graphics area

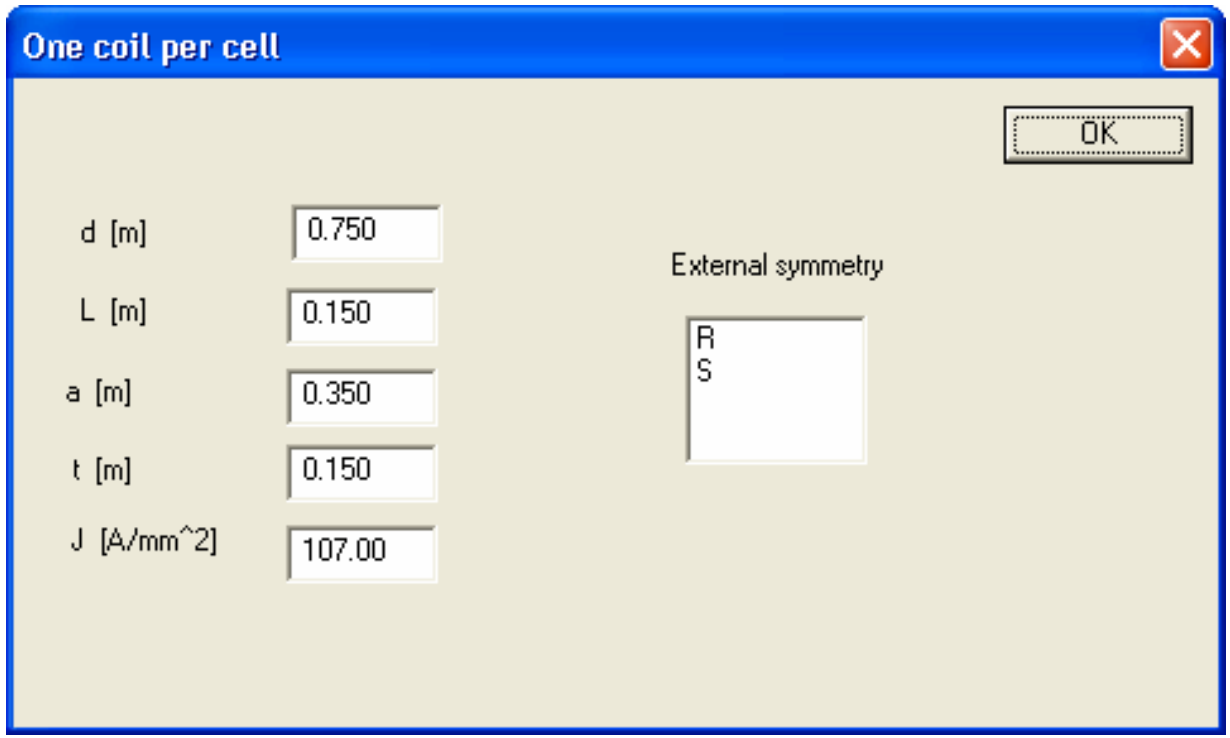
Mouse buttons

Data area

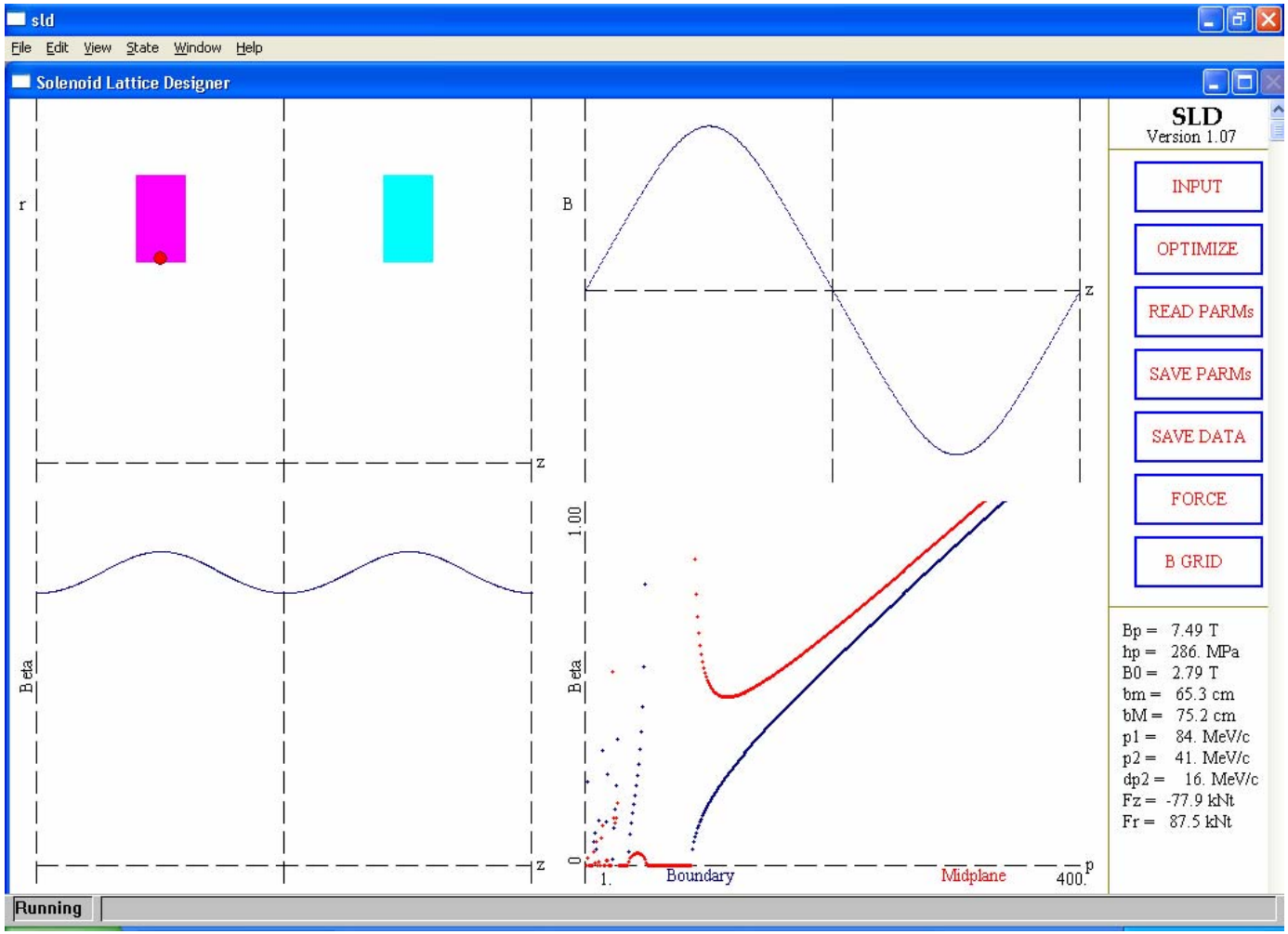
# Input button



# One coil per cell

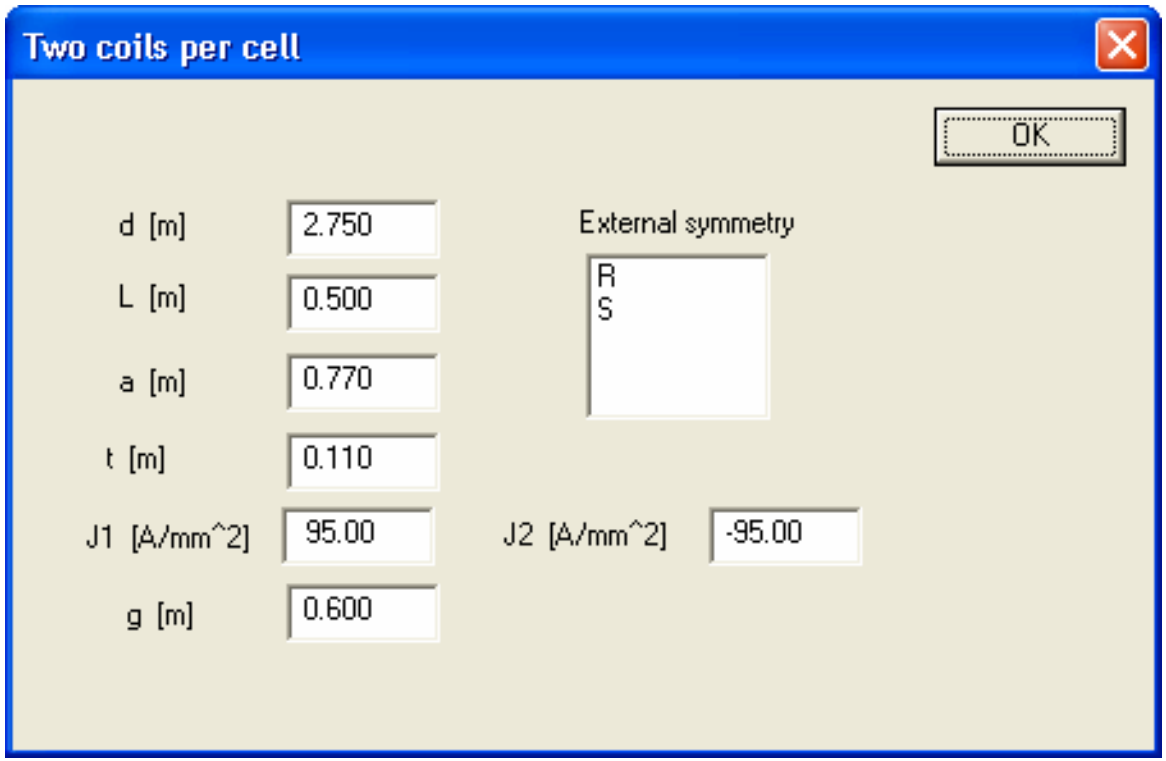


# One coil per cell

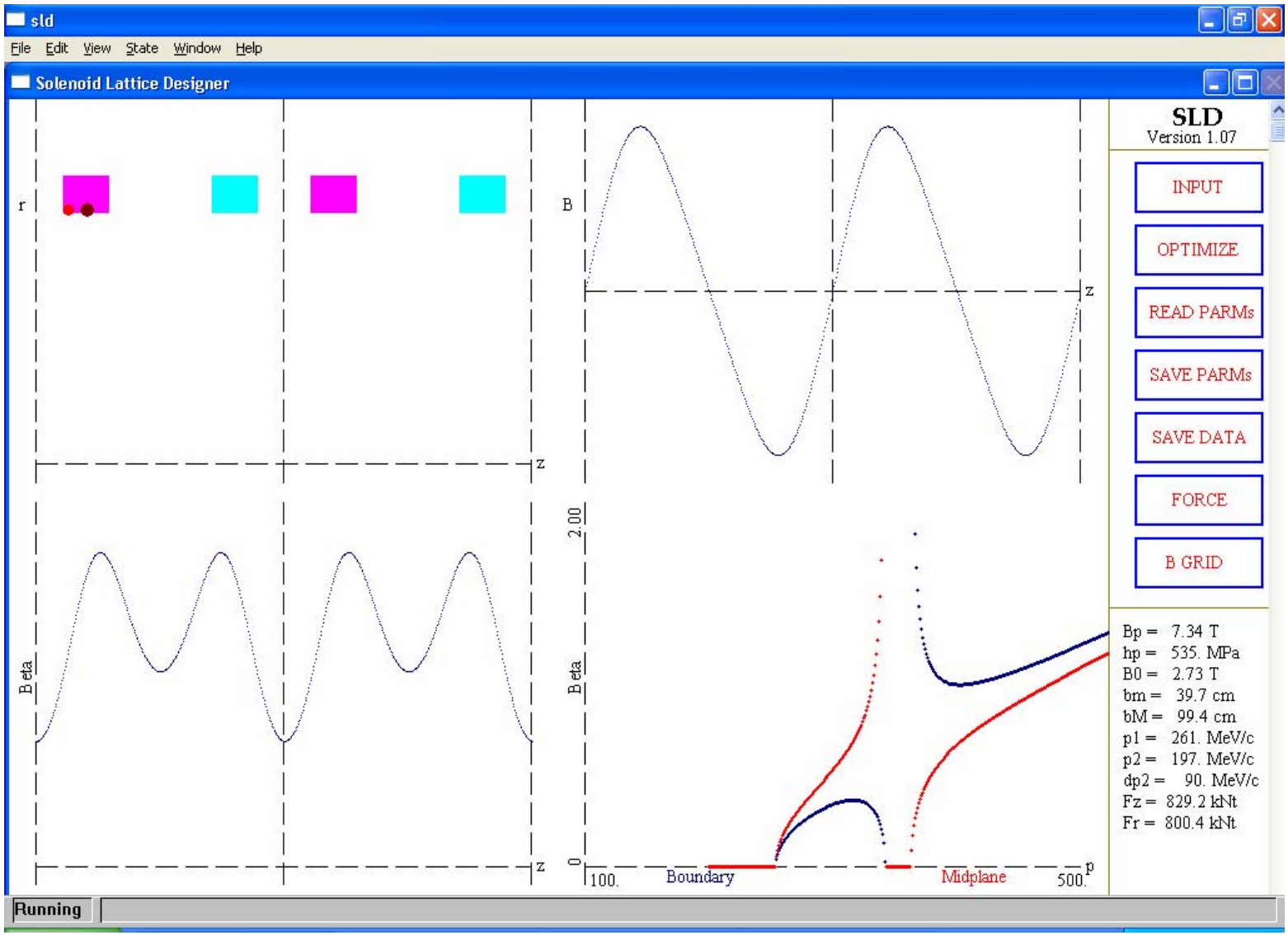



Study 2a

# Two coils per cell

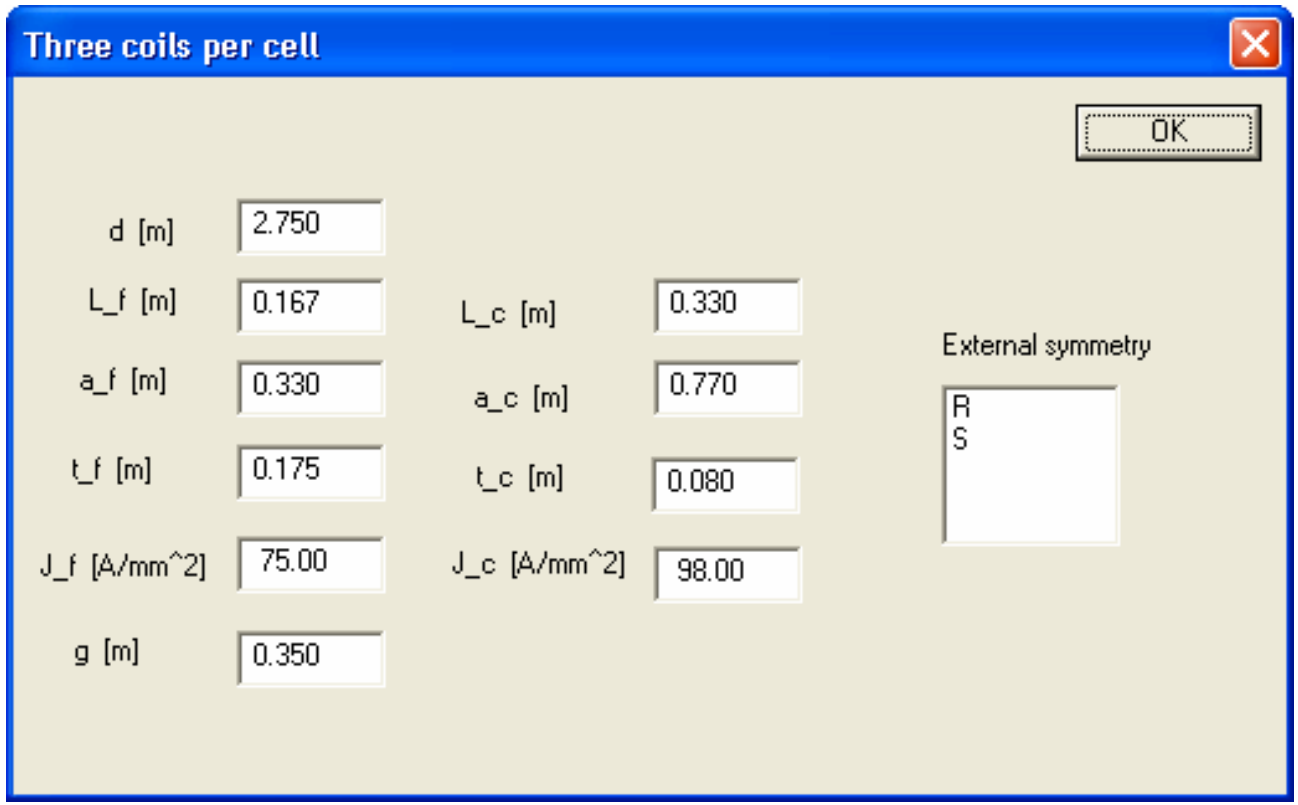


# Two coils per cell

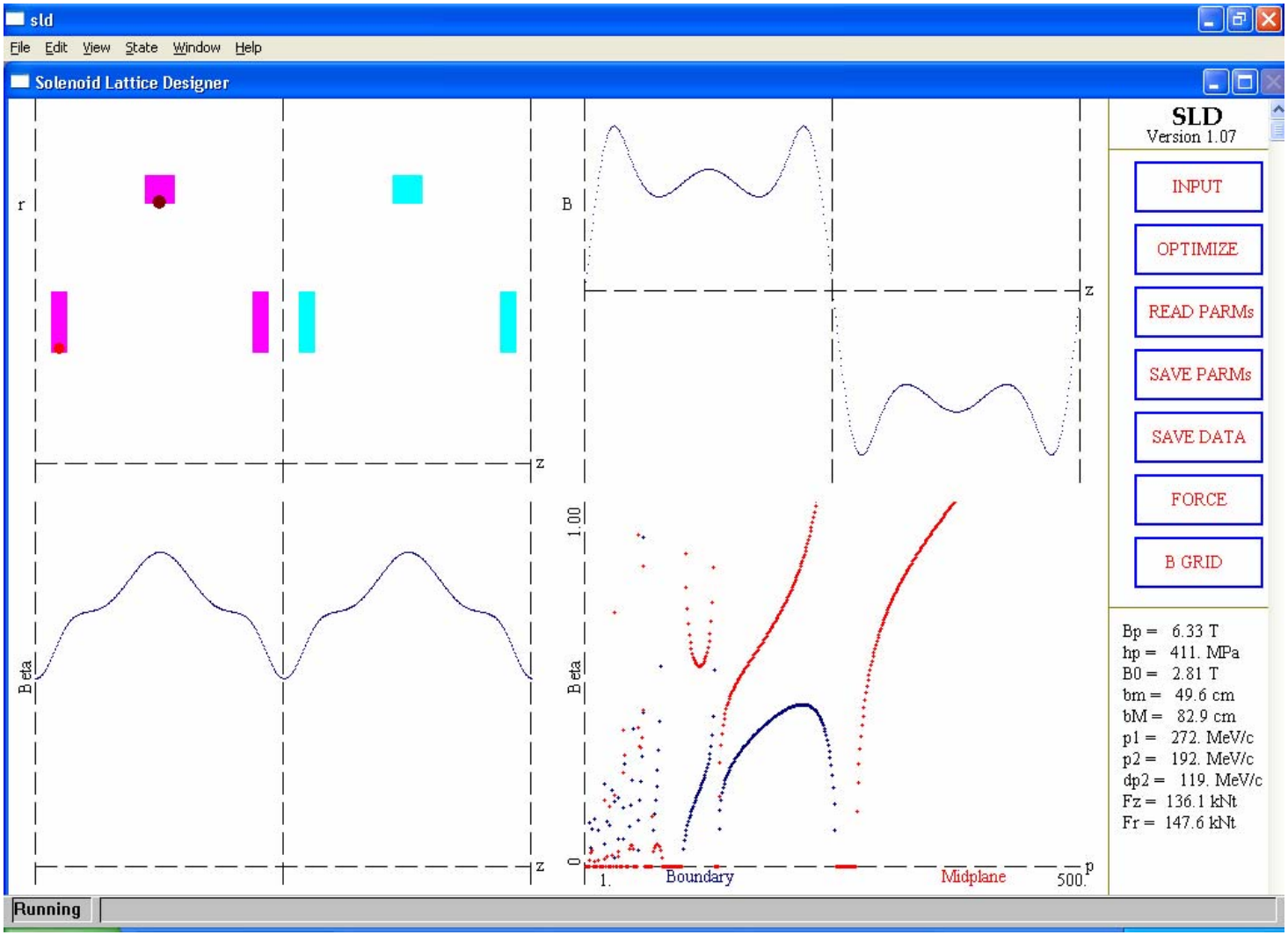



RFOFO

# Three coils per cell

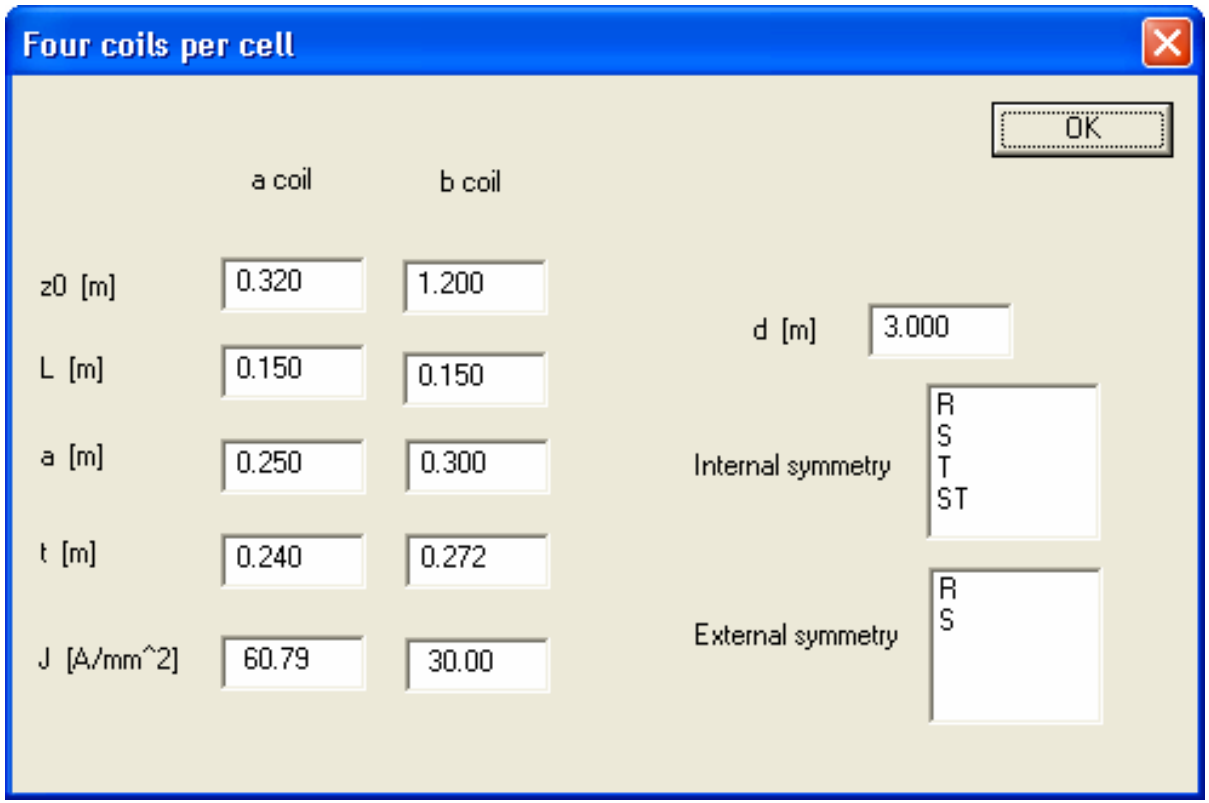


# Three coils per cell

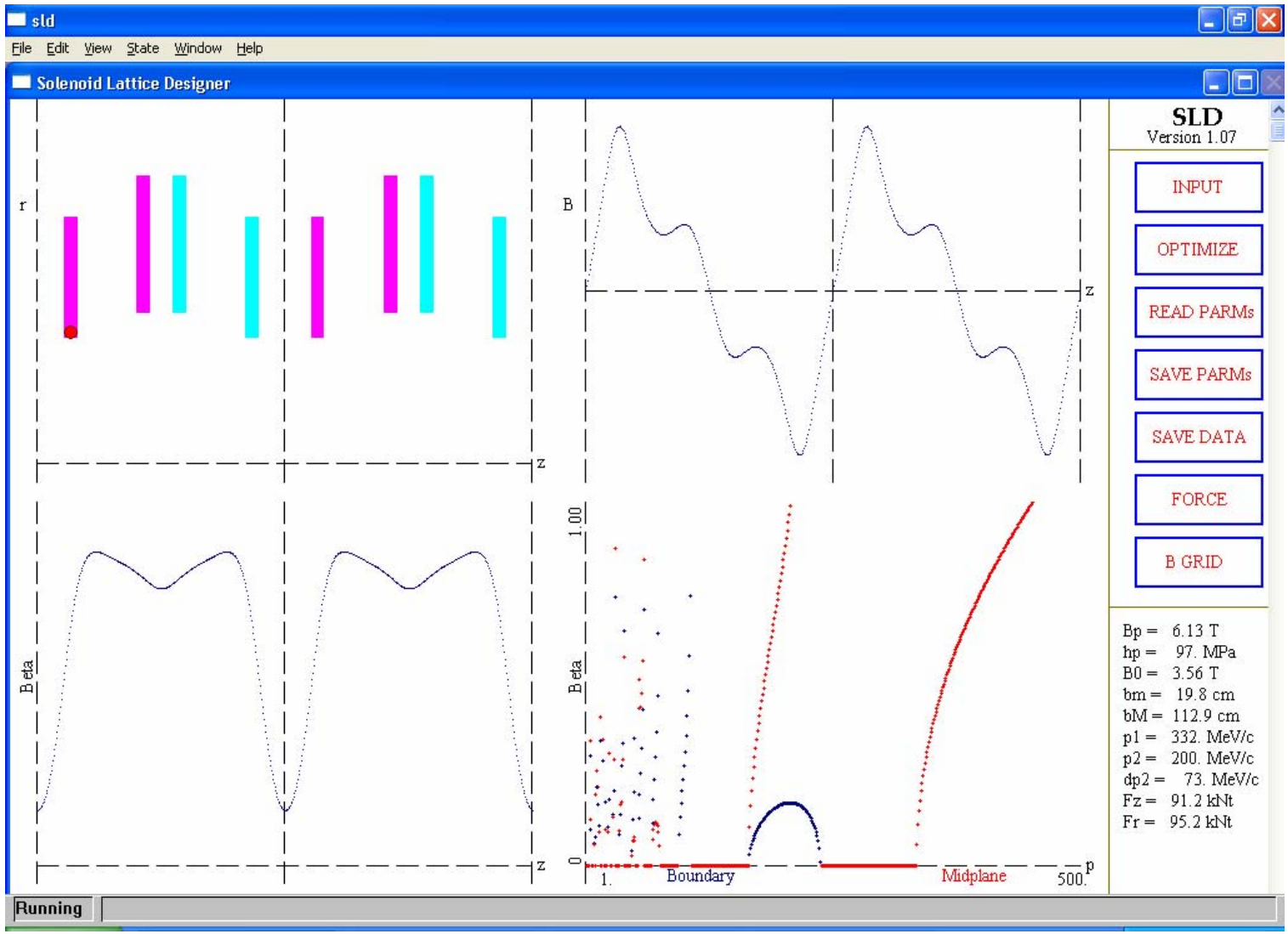



Study 2 (MICE)

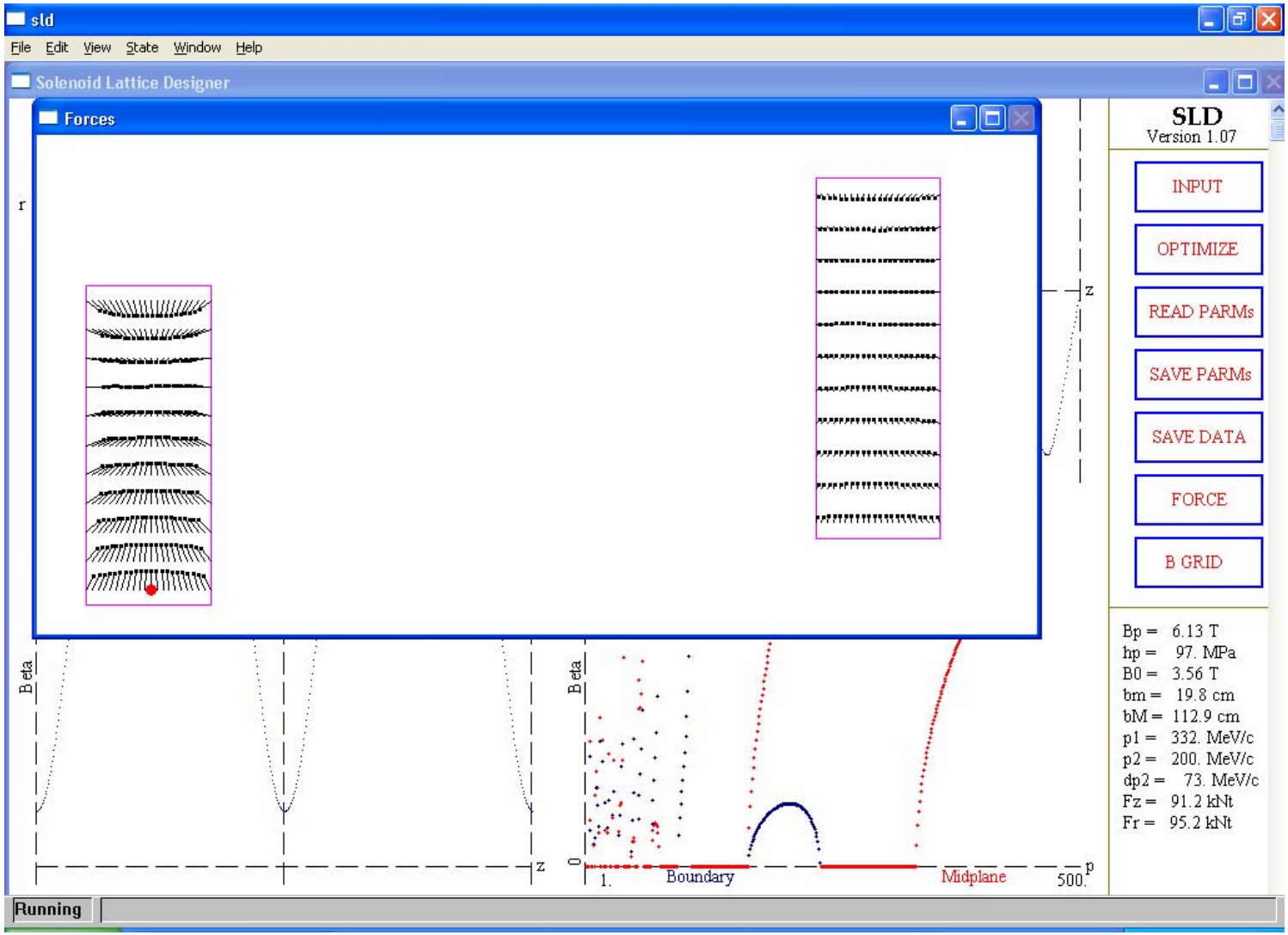
# Four coils per cell



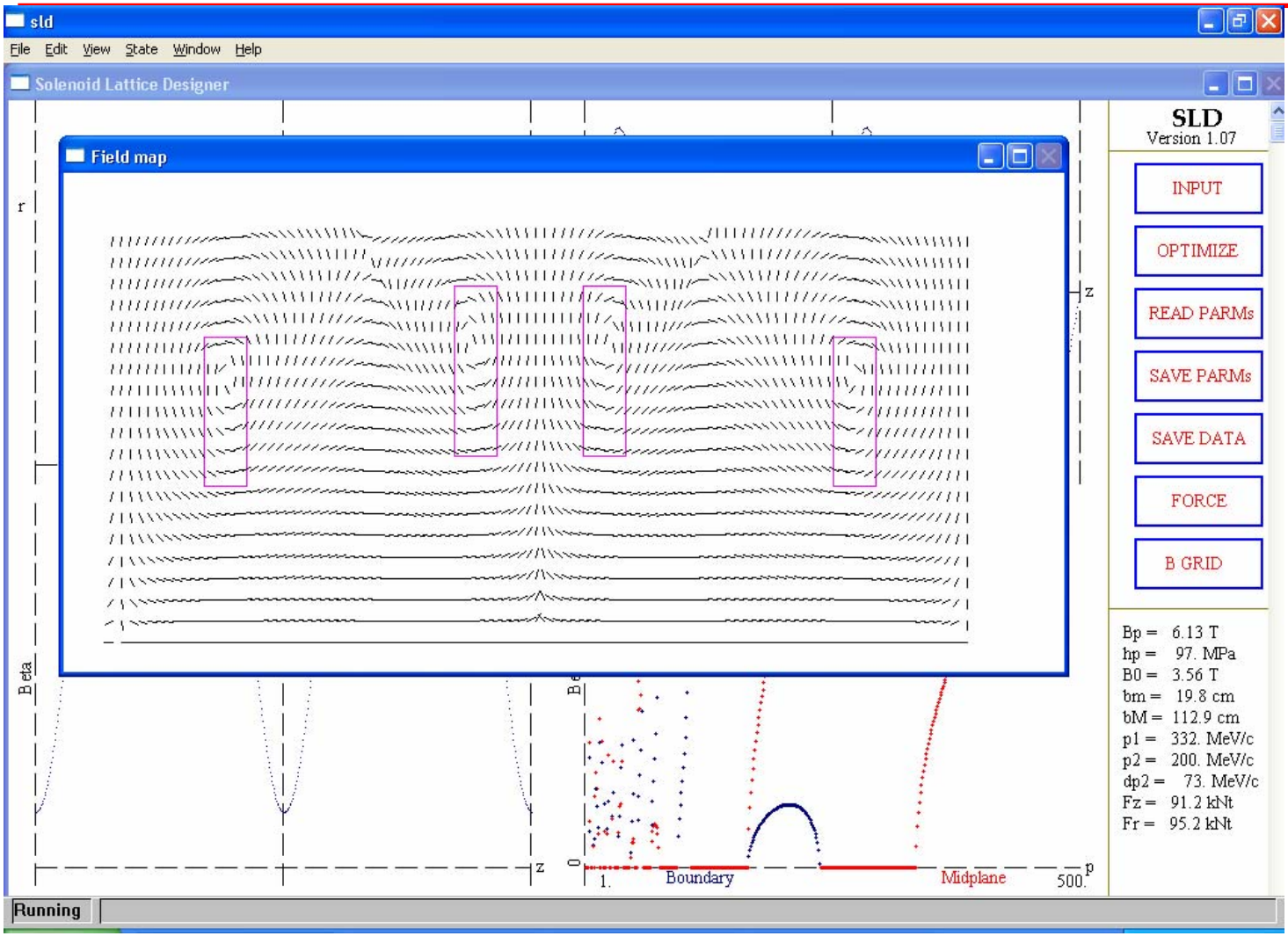
# Four coils per cell



# Forces


sld
File Edit View State Window Help
Solenoid Lattice Designer
Forces
r
z
Beta
z
Beta
0
1.
Boundary
Midplane
500.
p
SLD
Version 1.07
INPUT
OPTIMIZE
READ PARMs
SAVE PARMs
SAVE DATA
FORCE
B GRID
Bp = 6.13 T
hp = 97. MPa
B0 = 3.56 T
bm = 19.8 cm
bM = 112.9 cm
p1 = 332. MeV/c
p2 = 200. MeV/c
dp2 = 73. MeV/c
Fz = 91.2 kNt
Fr = 95.2 kNt
Running

# Field map


sld
File Edit View State Window Help
Solenoid Lattice Designer
Field map
r
z
Beta
B
0
1.
Boundary
Midplane
500.
p
SLD
Version 1.07
INPUT
OPTIMIZE
READ PARMs
SAVE PARMs
SAVE DATA
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B GRID
Bp = 6.13 T
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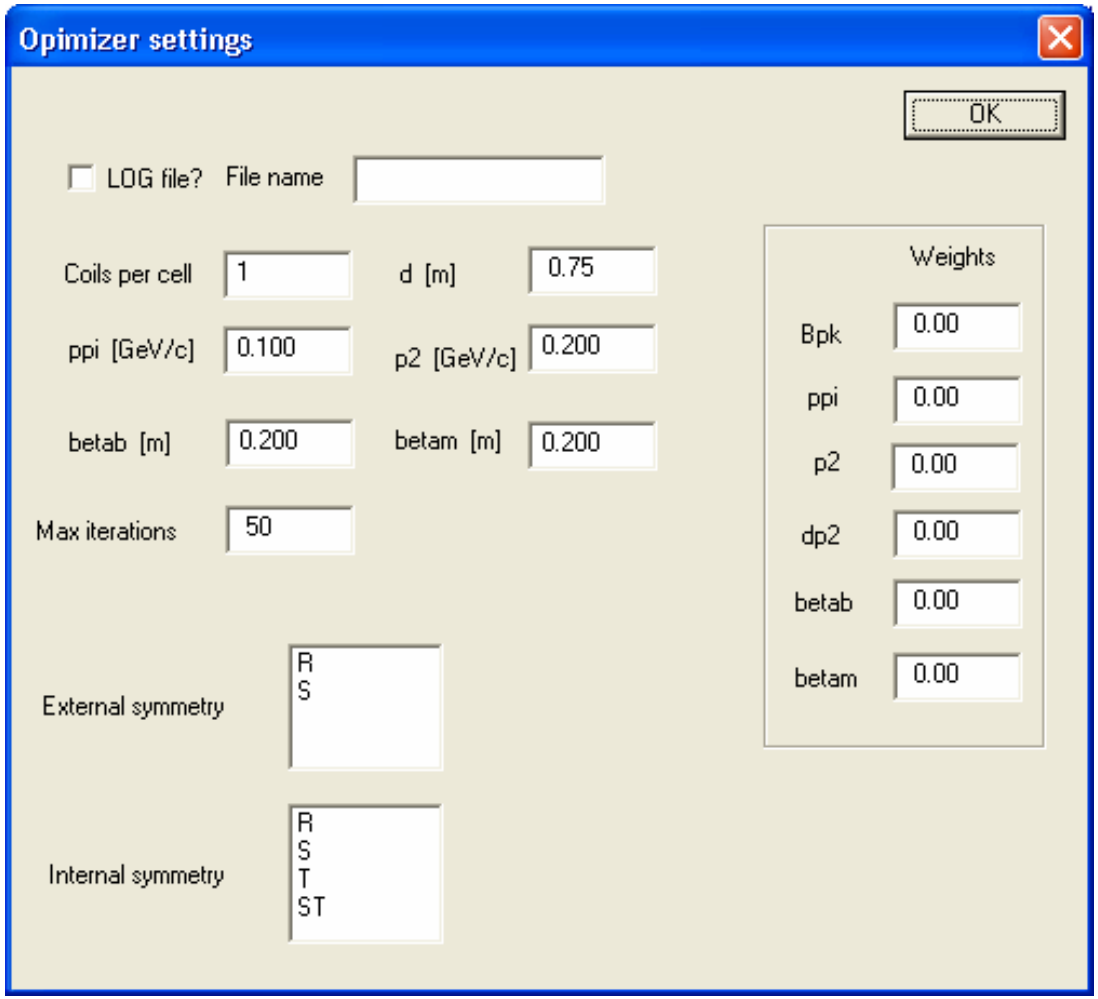
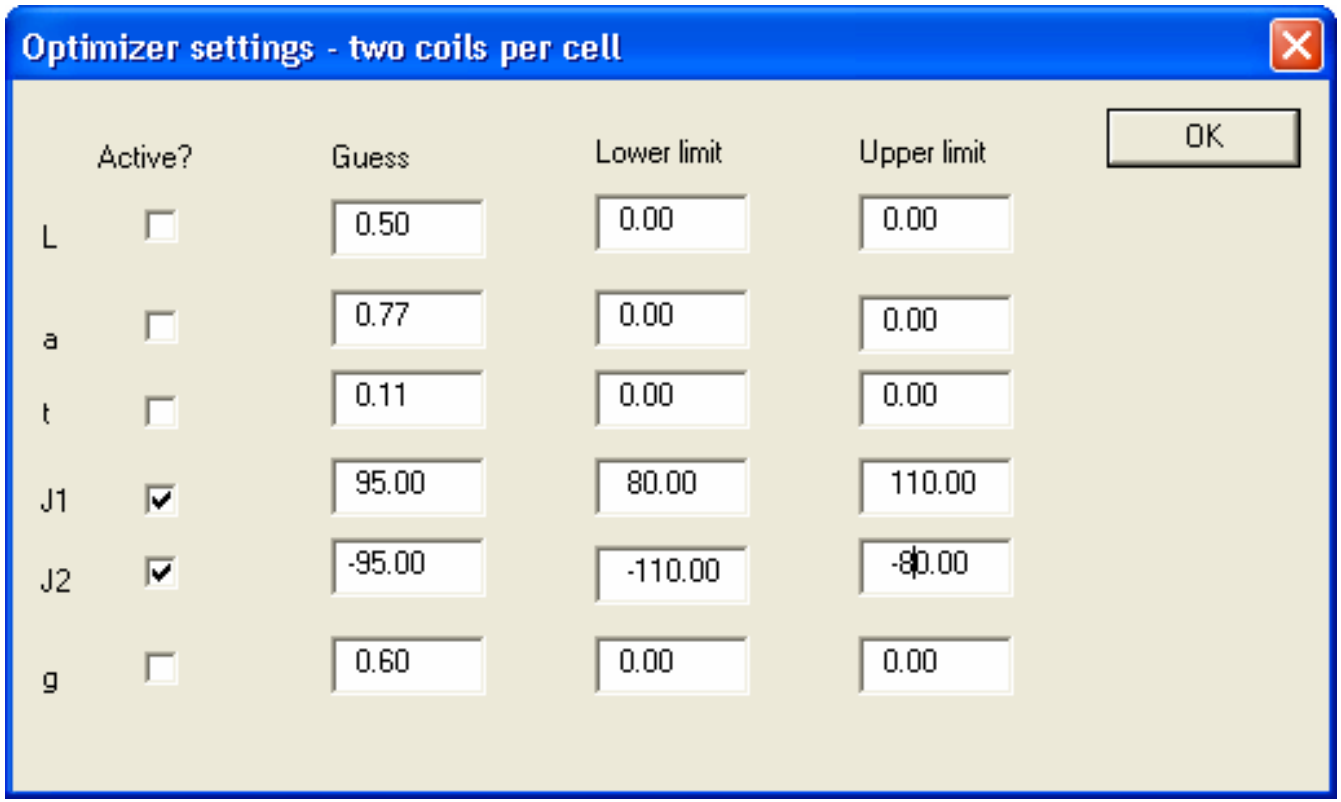
Running

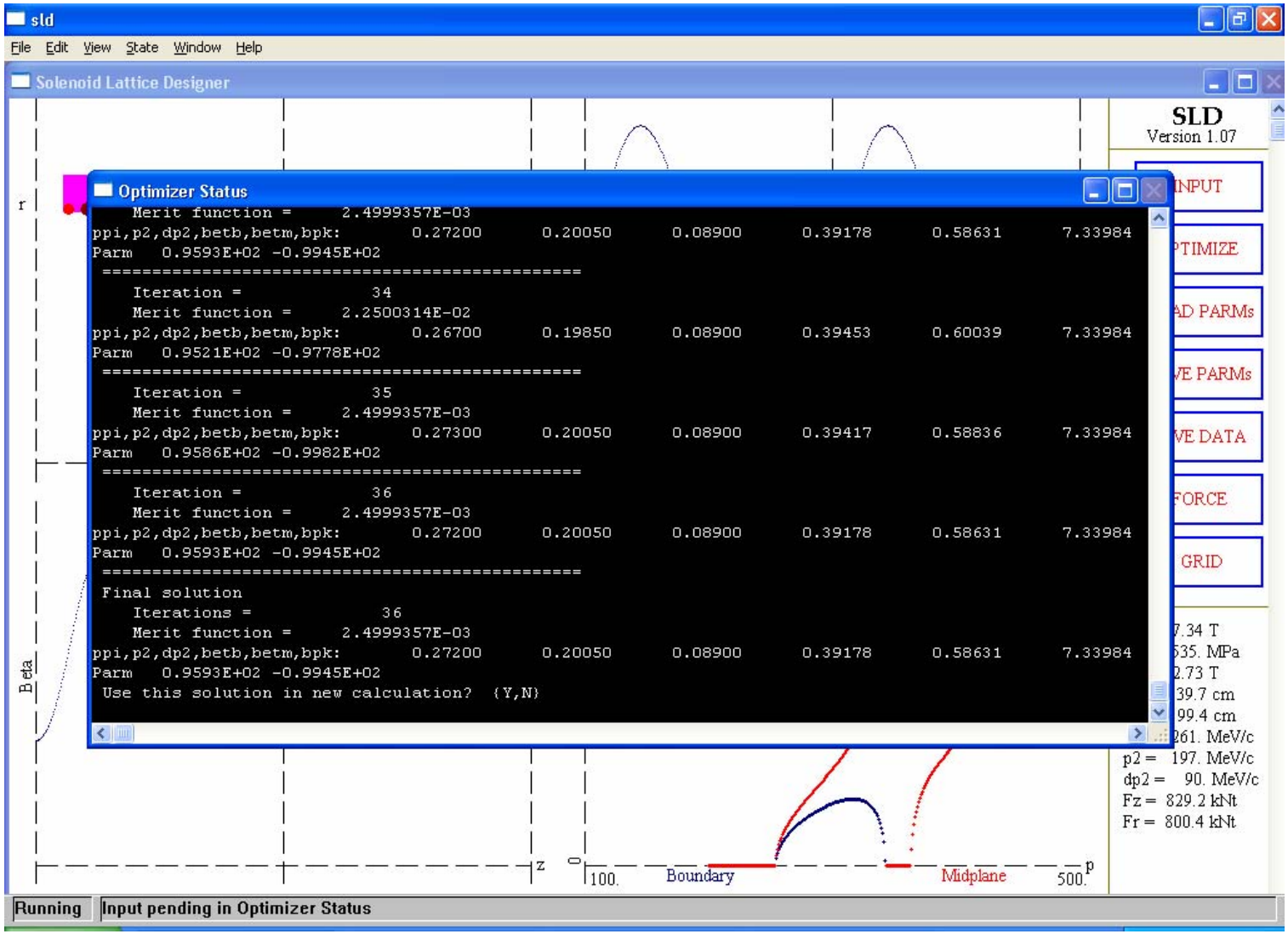
# Optimizer


Opimizer settings
OK
LOG file?
File name
Coils per cell
1
d [m]
0.75
ppi [GeV/c]
0.100
p2 [GeV/c]
0.200
betab [m]
0.200
betam [m]
0.200
Max iterations
50
Weights
Bpk
0.00
ppi
0.00
p2
0.00
dp2
0.00
betab
0.00
betam
0.00
External symmetry
R
S
Internal symmetry
R
S
T
ST

# Optimizer


Optimizer settings - two coils per cell
OK
Active?
Guess
Lower limit
Upper limit
L
0.50
0.00
0.00
a
0.77
0.00
0.00
t
0.11
0.00
0.00
J1
95.00
80.00
110.00
J2
-95.00
-110.00
-80.00
g
0.60
0.00
0.00

# Optimizer


sld
File Edit View State Window Help
Solenoid Lattice Designer
SLD
Version 1.07
INPUT
PTIMIZE
AD PARMs
VE PARMs
VE DATA
FORCE
GRID
Optimizer Status
Merit function = 2.4999357E-03
ppi,p2,dp2,betb,betm,bpk: 0.27200 0.20050 0.08900 0.39178 0.58631 7.33984
Parm 0.9593E+02 -0.9945E+02
Iteration = 34
Merit function = 2.2500314E-02
ppi,p2,dp2,betb,betm,bpk: 0.26700 0.19850 0.08900 0.39453 0.60039 7.33984
Parm 0.9521E+02 -0.9778E+02
Iteration = 35
Merit function = 2.4999357E-03
ppi,p2,dp2,betb,betm,bpk: 0.27300 0.20050 0.08900 0.39417 0.58836 7.33984
Parm 0.9586E+02 -0.9982E+02
Iteration = 36
Merit function = 2.4999357E-03
ppi,p2,dp2,betb,betm,bpk: 0.27200 0.20050 0.08900 0.39178 0.58631 7.33984
Parm 0.9593E+02 -0.9945E+02
Final solution
Iterations = 36
Merit function = 2.4999357E-03
ppi,p2,dp2,betb,betm,bpk: 0.27200 0.20050 0.08900 0.39178 0.58631 7.33984
Parm 0.9593E+02 -0.9945E+02
Use this solution in new calculation? (Y,N)
r
Beta
z
0
100.
Boundary
Midplane
500.
p
7.34 T
535. MPa
2.73 T
39.7 cm
99.4 cm
261. MeV/c
p2 = 197. MeV/c
dp2 = 90. MeV/c
Fz = 829.2 kNt
Fr = 800.4 kNt
Running
Input pending in Optimizer Status