

APPENDIX6

```

/BATCH
/COM,ANSYS RELEASE 6.1      UP20020321      14:58:59      12/18/2002
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
/prep7
k
k,,.794
k,,.794+.165
k,,2.064
k,,2.064+.165
k,,3.453
kgen,2,all,,,,102.2
/ratio,,10,1
kplo
a,1,2,8,7
*repe,5,1,1,1,1
/triad,off
/plopt,frame,off
aplo
ET,1,FLUID141,,,1
asel,,,,1,5,2
aatt,1,,1
asel,inve
aatt,2,,1
asel,all
aplo
lssel,,,,5,7,2
lssel,a,,,11,13,2
lesi,all,,,2
lssel,,,,2,6,2
lssel,a,,,9,15,3
lesi,all,,,102
lssel,all
lesi,1,,,10,1/5
lesi,3,,,10,5
lssel,,,,8,10,2
lssel,a,,,14,16,2
lesi,all,,,15,-5
lssel,all
MSHAPE,0,2D
MSHKEY,1
amesh,all
mp,dens,2,8.94
mp,kxx,2,4
mp,c,2,.383
FLDATA7,PROT,DENS,GAS
FLDATA8,NOMI,DENS,4.935e-008,
FLDATA9,COF1,DENS,1,
FLDATA10,COF2,DENS,1,
FLDATA11,COF3,DENS,0
FLDATA7,PROT,VISC,GAS
FLDATA8,NOMI,VISC,6.2985e-5,
FLDATA9,COF1,VISC,50,
FLDATA10,COF2,VISC,17,
FLDATA11,COF3,VISC,0

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FLDATA7,PROT,COND,GAS
FLDATA8,NOMI,COND,4.6679e-4,
FLDATA9,COF1,COND,50,
FLDATA10,COF2,COND,21,
FLDATA11,COF3,COND,0
FLDATA7,PROT,SPHT,CONSTANT
FLDATA8,NOMI,SPHT,5.2
dl,4,,vx,0,1 ! symmetry line
dl,15,,vy,0,1 ! wall
dl,15,,vx,0,1
lssel,,,3 ! outlet
lssel,a,,,10
lssel,a,,,16
dl,all,,pres,0,1
lssel,,,7,13,6 ! leads end
dl,all,,temp,300,1
lssel,,,1,5,4 ! other end
lssel,a,,,8,14,3
dl,all,,temp,4.2,1
lssel,all
dl,1,,vx,0 ! inlet
dl,1,,vy,11.25
d,1,vy,11.25
dl,8,,vx,0
dl,8,,vy,2.124
dl,14,,vx,0
dl,14,,vy,1.02
sfl,5,hflux,-12.097 ! heat flux into helium
sfl,11,hflux,-4.94
alls

/com, heat generation in conductors

esel,,mat,,2
*get,emx,elem,,num,max
*get,emn,elem,,num,min

*do,i,emn,emx
  *if,esel(i),eq,1,then
    *get,yy,elem,i,cent,y
    tt=4.2+2.8943*yy-30
    *if,tt,gt,0,then
      *get,xx,elem,i,cent,x
      *if,xx,gt,1.5,then
        qq=.5026e-4*tt
      *else
        qq=0.3014e-3*tt
      *endif
      bfe,i,hgen,,qq
    *endif
  *endif
*enddo

esel,all

FINISH
/SOLU
FLDATA1,SOLU,TRAN,0
FLDATA1,SOLU,FLOW,1
FLDATA1,SOLU,TEMP,0

```

```

FLDATA1,SOLU,TURB,0
FLDATA1,SOLU,COMP,0
FLDATA1,SOLU,VOF,0
FLDATA1,SOLU,SFTS,0
FLDATA1,SOLU,IVSH,0
FLDATA1,SOLU,SWRL,0
FLDATA1,SOLU,SPEC,0
FLDATA1,SOLU,ALE,0
!*
/COM,,Steady State Analysis,0
FLDATA2,ITER,EXEC,100,
FLDATA2,ITER,OVER,0,
FLDATA2,ITER,APPE,0,
FLDATA3,TERM,VX,0.01,
FLDATA3,TERM,VY,0.01,
FLDATA3,TERM,VZ,0.01,
FLDATA3,TERM,PRES,1e-008,
FLDATA3,TERM,TEMP,1e-008,
FLDATA3,TERM,ENKE,0.01,
FLDATA3,TERM,ENDS,0.01,
FLDATA5,OUTP,SUMF,10,
!*
FLDATA15,PRES,REFE,1013500,
FLDATA16,BULK,BETA,1e+015,
FLDATA17,GAMM,COMP,1.4,
FLDATA14,TEMP,NOMI,293,
FLDATA14,TEMP,TTOT,293,
FLDATA14,TEMP,BULK,293,
TOFFSET,0,
!*
SOLVE
FLDATA1,SOLU,TRAN,0
FLDATA1,SOLU,FLOW,1
FLDATA1,SOLU,TEMP,1
FLDATA1,SOLU,TURB,0
FLDATA1,SOLU,COMP,0
FLDATA1,SOLU,VOF,0
FLDATA1,SOLU,SFTS,0
FLDATA1,SOLU,IVSH,0
FLDATA1,SOLU,SWRL,0
FLDATA1,SOLU,SPEC,0
FLDATA1,SOLU,ALE,0
!*
SOLVE
fini
/post1
set,last
plns,v,sum
plns,temp
fini
/BATCH
/COM,ANSYS RELEASE 6.1      UP20020321      10:19:26      02/14/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1      UP20020321      10:19:29      02/14/2003
/post1

```

```

set,list
set,last
fini
! /exit,nosav
/BATCH
/COM,ANSYS RELEASE 6.1      UP20020321      10:21:01      02/14/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1      UP20020321      10:21:04      02/14/2003
/post1
set,last
plns,temp
eplo
mplis
esel,,mat,,2
eplo
nsle
plns,temp
eplo
/ratio,,10,1
eplo
elis
eplo
! /artio,,10,2
/ratio,,10,1
eplo
nplo
eplo
/ratio,1,10,1
eplo
/ratio,,20,1
eplo
/ratio,,50,1
eplo
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
plpa,tp1
/ratio
plpa,tp1
pdef,save
lpath,2886,2992,3000,,3017,3045,3067,2989
pdef,tp2,temp
eplo
/ratio,,50,1
eplo
nsle
lpath,2886,2993,3000,3017,3045,3067,2989
pdef,tp2,temp
/ratio
plpa,tp1,tp2
plpa,tp1
pcalc,deri,dt2,tp2,s
plpa,dt2
prpa,dt2
fini
! /exit,nosav

```

```

/BATCH
/COM,ANSYS RELEASE 6.1      UP20020321      13:34:33      02/14/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1      UP20020321      13:34:40      02/14/2003
/prep7
kplo
klis
mplis
fini
! /exit,nosav
/BATCH
/COM,ANSYS RELEASE 6.1      UP20020321      09:31:28      02/18/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1      UP20020321      09:31:32      02/18/2003
/prep7
/pbc,all,1
aplo
eplo
lplo
/pbc,all
lplo
bfelis
bflis
fini
/post1
set
set,last
plns,temp
esel,,mat,,2
*get,emx,elem,,num,max
*get,emn,elem,,num,min
*dim,newt,,3000
etable,mytp,temp
pret,mytp
*dim,newx,,3000
*do,i,emn,emx
*if,esel(i),eq,1,then
*endif
*enddo
*status,newx(1)
elis
*do,i,emn,emx
*if,esel(i),eq,1,then
*endif
*enddo
*status,newx(1)
*status
*status,xx
*status,xxx

```

```

*status,xxx
*do,i,emn,emx
*if,esel(i),eq,1,then
*else
*endif
! *emddo
*enddo
*status,newt(1)
*get,ttt,elem,1021,etab,mytp
*status,newt(1)
*status,ttt
*status,newt(1021)
set,newt(1021),ttt
*set,newt(1021),ttt
*status,newt(1021)
*do,i,emn,emx
*if,esel(i),eq,1,then
*else
*endif
*enddo
*status,newt(1021)
*do,i,emn,emx
*if,esel(i),eq,1,then
*else
*endif
*enddo
*status,newt(1)
fini
! /exit,nosav
/BATCH
/COM,ANSYS RELEASE 6.1      UP20020321      11:28:26      02/18/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1      UP20020321      11:28:29      02/18/2003
/post1
set,last
plns,temp
*dim,newt,,3000
*dim,newx,,3000
esel,,mat,,2
*get,emx,elem,,num,max
*get,emn,elem,,num,min
etable,mytp,temp
pret,mytp
*do,i,emn,emx
*if,esel(i),eq,1,then
*else
*endif
*enddo
*status,newt(1)
pretable
etable,mycx,cent,x
pret
*vget,newt,elem,1,etab,mytp
*status,newt(1)
*vget,newx,elem,1,etab,mycx

```

```

*status,newx(1)
fini
/prep7
*status,newx(1)
eplo
esel,,mat,,2
nsle
nsel,r,loc,x,0,1.5
esln
esel,r,mat,,2
*get,emx,elem,,num,max
*get,emn,elem,,num,min
*do,i,emn,emx
*if,esel(i),eq,1,then
*if,newt(i),lt,30,then
*else
*endif
*SET,qqe , rre*4.8378e-6
bfe,i,hgen,,qqe
*endif
*enddo
/input,nloop,txt
bfelis
eplo
save
fini
/post1
set,last
plns,temp
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
plpa,tp1
/ratio
plpa,tp1
pdef,save
lpath,2886,2992,3000,,3017,3045,3067,2989
pdef,tp2,temp
plpa,tp1,tp2
plpa,tp2
plpa,tp1
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
plpa,tp1
/ratio,,50,1
eplo
pdef,save
lpath,2886,2994,3000,3017,3045,3067,2989
pdef,tp2,temp
plpa,tp1,tp2
/ratio,,
plpa,tp1,tp2
plpa,tp1
PLPA,tp2
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
plpa,tp1
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
pcalc,deri,dt1,tp1,s

```

```

plpa,dt1
prpa,dt1
lpath,2886,2994,3000,3017,3045,3067,2989
pdef,tp2,temp
pcalc,deri,dt2,tp2,s
plpa,dt2
prpa,dt2
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
pcalc,deri,dt1,tp1,s
plpa,dt1
*get,dtin,path,,item,dt1,1,1
*get,dtin,path,,item,dt1,pathpt,1
lpath,2886,2994,3000,3017,3045,3067,2989
pdef,tp2,temp
pcalc,deri,dt2,tp2,s
plpa,dt2
*get,dtou,path,,item,dt2,pathpt,1
fini
/prep7
*status
*SET,theat,3.6372*dtin+8.9068*dtou
*SET,tevap,theat/20/16.45e-3
*SET,v1,tevap/3/1.9806
*SET,v2,tevap/3/10.494
*SET,v3,tevap/3/21.849
! evaporation flow velocities
eplo
/ratio,,10,1
eplo
*SET,v1,tevap/3/1.9806
*SET,v2,tevap/3/10.494
*SET,v3,tevap/3/21.849
! evaporation flow velocities
lplo
dl,1,,vy,v1*1.1
dl,8,,vy,v2*1.1
dl,14,,vy,v3*1.1
alls
save
fini
/SOLU
FLDATA1,SOLU,TRAN,0
FLDATA1,SOLU,FLOW,1
FLDATA1,SOLU,TEMP,1
FLDATA1,SOLU,TURB,0
FLDATA1,SOLU,COMP,0
FLDATA1,SOLU,VOF,0
FLDATA1,SOLU,SFTS,0
FLDATA1,SOLU,IVSH,0
FLDATA1,SOLU,SWRL,0
FLDATA1,SOLU,SPEC,0
FLDATA1,SOLU,ALE,0
!*
/COM,,Steady State Analysis,0
FLDATA2,ITER,EXEC,100,
FLDATA2,ITER,OVER,0,
FLDATA2,ITER,APPE,0,
FLDATA3,TERM,VX,0.01,
FLDATA3,TERM,VY,0.01,
FLDATA3,TERM,VZ,0.01,

```



```

plns,temp
plns,v,sum
plns,temp
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/post1
set,last
plns,temp
/ratio,,10,1
plns,temp
PLNS,v,sum
fini
/BATCH
/COM,ANSYS RELEASE 6.1 UP20020321 09:56:43 02/19/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/COM,ANSYS RELEASE 6.1 UP20020321 09:56:43 02/19/2003
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1 UP20020321 09:56:46 02/19/2003
fini
! /exit,nosav
/BATCH
/COM,ANSYS RELEASE 6.1 UP20020321 11:12:09 02/19/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON
/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1 UP20020321 11:12:12 02/19/2003
/post1
set,last
plns,temp
/tit,Temperature distribution
plns,temp
fini
! /exit,nosav
/BATCH
/COM,ANSYS RELEASE 6.1 UP20020321 13:57:45 02/19/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/GRA,POWER
/GST,ON
/PLO,INFO,3
/GRO,CURL,ON

```

```

/REPLOT,RESIZE
RESUME
/COM,ANSYS RELEASE 6.1 UP20020321 13:57:54 02/19/2003
/prep7
mplis
mpdel,kxx,2
mplis
mptemp,1,4,6,8,10,15,20
mptemp,7,25,30,35,40,50,60
mptemp,13,70,76,80,90,100,120
mptemp,19,140,160,180,200,250,300
mpdata,kxx,2,1,3.2,4.8,6.3,7.8,11,13
mpdata,kxx,2,7,14,14,13,11.5,8.8,7
mpdata,kxx,2,13,5.9,5.5,5.2,4.7,4.5,4.3
mpdata,kxx,2,19,4.2,4.1,4,4,4,4
mpplo,kxx,2
/ratio
mpplo,kxx,2
eplo
/ratio,,10,1
eplo
fini
/sol
solv
fini
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
/input,nloop,txt
*status
fini
/post1
set,last
plns,temp
/ratio,,10,1
plns,temp
lpath,1135,1241,1249,1266,1295,1318,1238
pdef,tp1,temp
plpa,tp1
/ratio
plpa,tp1
/noerase
lpath,2886,2994,3000,3017,3045,3067,2989
pdef,tp2,temp
plpa,tp2
/erase
plpa,tp2
/yrange,0,300
plpa,tp2
fini
/BATCH
/COM,ANSYS RELEASE 6.1 UP20020321 14:39:10 02/19/2003

```

```

/input,menust,tmp,'',,,,,,,,,,,,,,1
/gra,power
/gst,on
/plo,info,3
/gro,curl,on
/replot,resize
resume
/com,ansys release 6.1      UP20020321      14:39:12      02/19/2003
/post1
set,last
plns,temp
/ratio,,10,1
plns,temp
esel,,mat,,1
plns,temp
plns,v,sum
fini
! /exit,nosav
/batch
/com,ansys release 6.1      UP20020321      13:28:17      02/20/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/gra,power
/gst,on
/plo,info,3
/gro,curl,on
/replot,resize
! /exit,nosav
/batch
/com,ansys release 6.1      UP20020321      14:31:44      04/16/2003
/input,menust,tmp,'',,,,,,,,,,,,,,1
/gra,power
/gst,on
/plo,info,3
/gro,curl,on
/replot,resize
resume
/com,ansys release 6.1      UP20020321      14:31:49      04/16/2003
/prep7
aplo
/ratio,,10,1
aplo
flst,5,3,3,orde,3
fitem,5,1
fitem,5,6
fitem,5,12
kSEL,S,, ,P51X
klis
bfelis
mplis
mpplot,kxx,2
/ratio
mpplot,kxx,2
esel,,mat,,2
bfelis
fini
/post1
set,list
set,,, , , ,30
fini
! /exit,nosav

```