/title, Forces and frequency between two permanent magnets.

/nopr

!npts=16

!\*dim,dist,table,npts

!\*dim,F,table,npts,2

d=0

d\_air=0

!\*do,i,1,npts

!parsave,all

!/clear,nostart

!parres

! Problem parameters

Pi=acos(-1)

mu0=4\*Pi\*1e-7 ! permeability of free space, H/m

mu0r=1 ! relative permeability of free space

Br=0.38 ! residual induction, tesla

a=10 $ b=6 $ c=3 ! lower magnet dimensions

aa=6 $ bb=10 $ cc=3 ! upper magnet dimensions

xo=-4 $ yo=-4 $ zo=8 ! upper magnet center offset

/com, \*\*\* Upper Magnet Displacement d = %d% (mm)

/PREP7

! Solid model

block,-a,a,-b,b,-c,c ! lower magnet volume

wpoff,xo,yo,zo

block,-aa+d,aa+d,-bb,bb,-cc,cc ! upper (moving) magnet volume

vplot

wpoff,-xo,-yo,-zo

block,-30,30+d\_air,-34,26,-23,31 ! air box

vovlap,all

! Finite element model

esize,1

et,1,SOLID236 ! magnetic solid

keyop,1,7,1 ! condense forces to the corner nodes

vmesh,1,2

esize,4

numcmp,volu

esha,1

vmesh,3

! Material properties

mp,mgzz,2,Br/mu0

mp,murx,2,mu0r

mp,murx,1,mu0r

vsel,s,,,1,2,,1

emod,all,mat,2

alls

nsel,s,ext

d,all,az,0 ! flux parallel boundary conditions

alls

vlscale,all,,,1e-3,1e-3,1e-3,,,1 ! scale the volumes to mm

WPSTYLE,,,,,,,,0

/ANG,1

/VIEW,1,1,1,1

/VUP,1,Z

esel,s,mat,,2

eplot

alls

fini

/SOLU

solve

fini

/POST1

vsel,s,,,2,,,1 ! select lower magnet along with the

! associated elements and nodes

esln

EMFT ! sum up magnetic forces

alls

esel,s,mat,,2

/VSCALE,,0.3

plvect,b,,,,vect,elem,on,on ! plot magnetic field

plvect,fmag,,,,vect,node,on,on ! plot magnetic forces

alls

fini

!/com, i = %i%

!dist(i)=d

!F(i,1)=\_fxsum ! FX sum calculated by EMFT

!F(i,2)=\_fysum ! FY sum calculated by EMFT

!d=d+2 ! upper magnet displacement update

!\*if,d,gt,8,then

!d\_air=d-8

!\*endif

!\*enddo

!/axlab,x,Distance d (mm)

!/axlab,y,Forces acting the magnet (N)

!/gcol,1,Fx

!/gcol,2,Fy

!\*vplot,dist(1),F(1,1),2