Square Spiral Incremental Layer

Table of Contents

X = rectangular_planar_inductor(N,A,L,A0,L0,d,h,x0,y0,z0,phix,phiy,phiz,view)

This function generates a planar rectangular multilayer spiral - PCB Inductor The coil will have enough layers to acomodate all N turns. The first layer will be generated with center in (0,0,0) in XY plane The layers will be generated below (z<0) the first layer. It can be moved using the x0,..,phix... parameters

Parameters

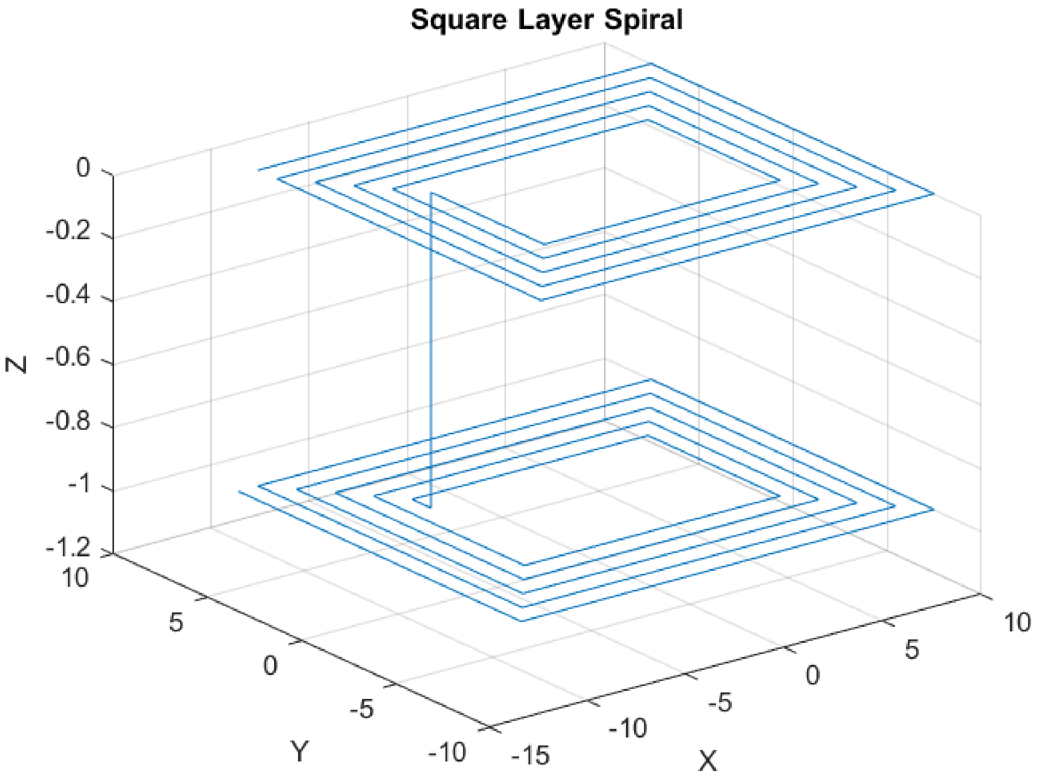
- @param **N** Number of Turns
- @param **A** Width of the coil
- @param **L** Height of the coil
- @param **A0** Internal width of the coil
- @param **L0** Internal height of the coil
- @param **d** Distane bewtween turns
- @param **h** Total height of the coil (distance_between_coils*n_coils)
- @param **x0** Center position X
- @param **y0** Center position Y
- @param **z0** Center position Z
- @param **phix** Turn respect X axis
- @param **phiy** Turn respect Y axis
- @param **phiz** Turn respect Z axis
- @param **view** Optional parameter, if true generates figure with geometry
- @retval **X** Geometry nodes

Code

```
function X =
 rectangular_planar_inductor(N,A,L,A0,L0,d,h,x0,y0,z0,phix,phiy,phiz,view)
 Rx=[1,0,0;0,cos(phix),-sin(phix);0,sin(phix),cos(phix)];
 Ry=[cos(phiy),0,sin(phiy);0,1,0;-sin(phiy),0,cos(phiy)];
 Rz=[cos(phiz),-sin(phiz),0;sin(phiz),cos(phiz),0;0,0,1];

 Nremainding=N; Nmax=floor(min(A/2-A0/2,L/2-L0/2)/d);
 i=1; %Calculate turns per Layer
 while Nremainding>0
  if Nremainding>Nmax
   Nlayer(i)=Nmax;
   Nremainding=Nremainding-Nmax;
  else
   Nlayer(i)=Nremainding;
   Nremainding=Nremainding-Nremainding;
  end
  i=i+1;
 end
 hlayer=h/(size(Nlayer,2)-1);

 X=square_spiral(Nlayer(1),A,L,d,0,0,0,0,0,0,false);
 %@TODO: Clean this fucking mess
 for i=2:1:size(Nlayer,2)
  if  mod(i,2)==1 %Assures the correct direction of the turns
   Xaux=X(:,size(X,2))+[0;0;-hlayer];
   X=[X,Xaux,square_spiral(Nlayer(i),A,L,d,0,0,-
hlayer*(i-1),0,0,0,false)];
  else %Even layers are more complicated
   Xaux=fliplr(square_spiral(Nlayer(i),A,L,d,0,0,-
hlayer*(i-1),pi,0,0,false));
   Xaux(:,1)=[];%pops first data
   Xaux2(:,1)=X(:,size(X,2))+[0;0;-hlayer];
   if Nlayer(i)== Nmax
    X=[X,Xaux2,Xaux,Xaux(:,size(Xaux,2))+[-
d;0;0],Xaux(:,size(Xaux,2))+[-d;L;0] ];
   else %Connection to the last turn has to be manually made
    Xaux(:,1)=[];
    Xaux3=Xaux2+[0;d*(Nmax-Nlayer(i)+1);0];
    X=[X,Xaux2,Xaux3,Xaux,Xaux(:,size(Xaux,2))+[-
d;0;0],Xaux(:,size(Xaux,2))+[-d;L;0] ];
   end
  end
 end

 for i=1:size(X,2)
  X(:,i)=transpose(Rx*[X(1,i);X(2,i);X(3,i)]);
  X(:,i)=transpose(Ry*[X(1,i);X(2,i);X(3,i)]);
  X(:,i)=transpose(Rz*[X(1,i);X(2,i);X(3,i)]);
  X(:,i)=X(:,i)+[x0;y0;z0];
 end

 if nargin>13
  if view
   plot3(X(1,:),X(2,:),X(3,:))
   grid on
   xlabel('X')
   ylabel('Y')
   zlabel('Z')
```

```
      title('Square Layer Spiral');
    end
  end
end
```

Geometry



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