
Circular Planar Inductor

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`X = circular_planar_inductor(N,r0,ri,d,phi0,RES,h,x0,y0,z0,phix,phiy,phiz,view)`

This function generates a planar circular multilayer spiral - PCB Inductor. The coil will have enough layers to accommodate 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 $x0, \dots, phix, \dots$ parameters.

Parameters

- @param **N** Number of Turns
- @param **r0** External radius of the coil
- @param **ri** Internal radius of the coil
- @param **d** Distance between turns
- @param **phi0** Angle at which the turns start
- @param **RES** Number of nodes of the Geometry (Discretization)
- @param **h** Distance between layers of the Coil
- @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 =  
    circular_planar_inductor(N,r0,ri,d,phi0,RES,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];

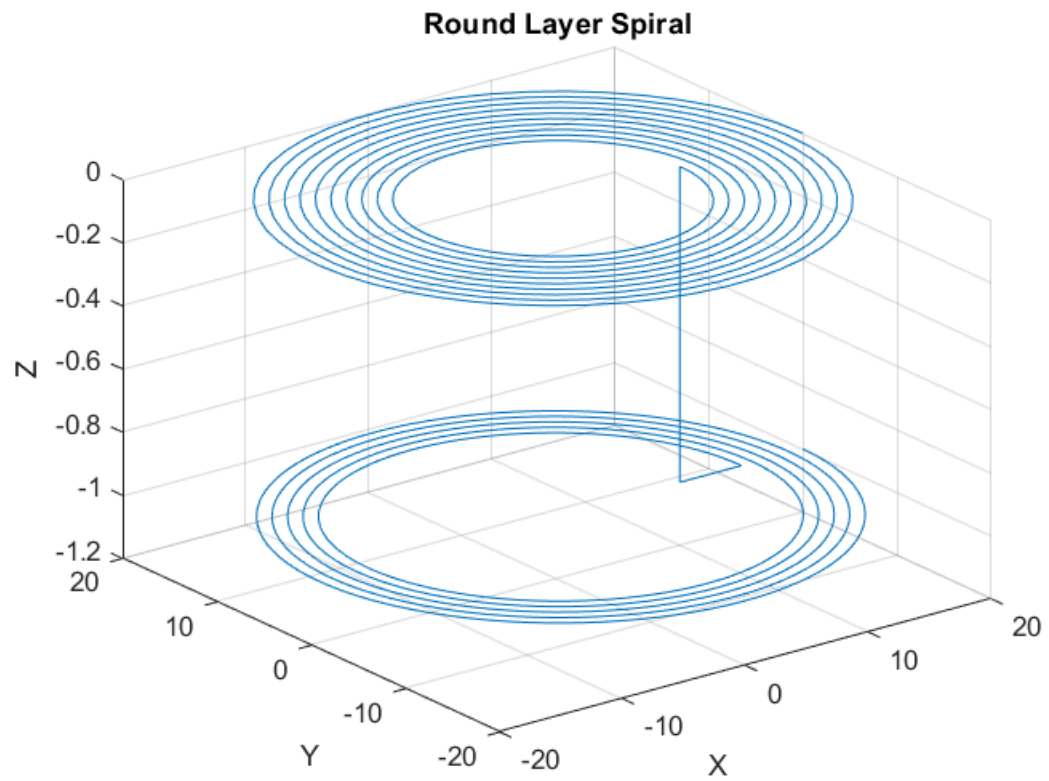
Nremaining=N; Nmax=floor((r0-ri)/d);
i=1;
while Nremaining>0 %Calculate turns per Layer
    if Nremaining>Nmax
        Nlayer(i)=Nmax;
        Nremaining=Nremaining-Nmax;
    else
        Nlayer(i)=Nremaining;
        Nremaining=Nremaining-Nremaining;
    end
    i=i+1;
end
hlayer=h/(size(Nlayer,2)-1); %Height of each layer

X=round_spiral(Nlayer(1), r0, d, phi0, RES, 0, 0, 0, 0, 0, false);
for i=2:1:size(Nlayer,2)
    if mod(i,2)==1 %Assures the correct direction of the turns
        X=[X,round_spiral(Nlayer(i), r0, d, phi0, RES, 0, 0, -hlayer*(i-1),
0, 0, 0, false)];
    else
        if Nlayer(i)== Nmax
            X=[X,fliplr(round_spiral(Nlayer(i), r0, d, phi0, RES, 0, 0, -
hlayer*(i-1), pi, 0, 0, false))];
        else %Connection to the last turn has to be manually made
            Xaux=X(:,size(X,2))+[0;0;-hlayer]; %@TODO: Warning two points of
the inductor could overlap
            X=[X,Xaux,fliplr(round_spiral(Nlayer(i), r0, d, phi0, RES, 0, 0, -
hlayer*(i-1), pi, 0, 0, false))];
        end
    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('Round Layer Spiral');
    end
end
end
```

Geometry



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