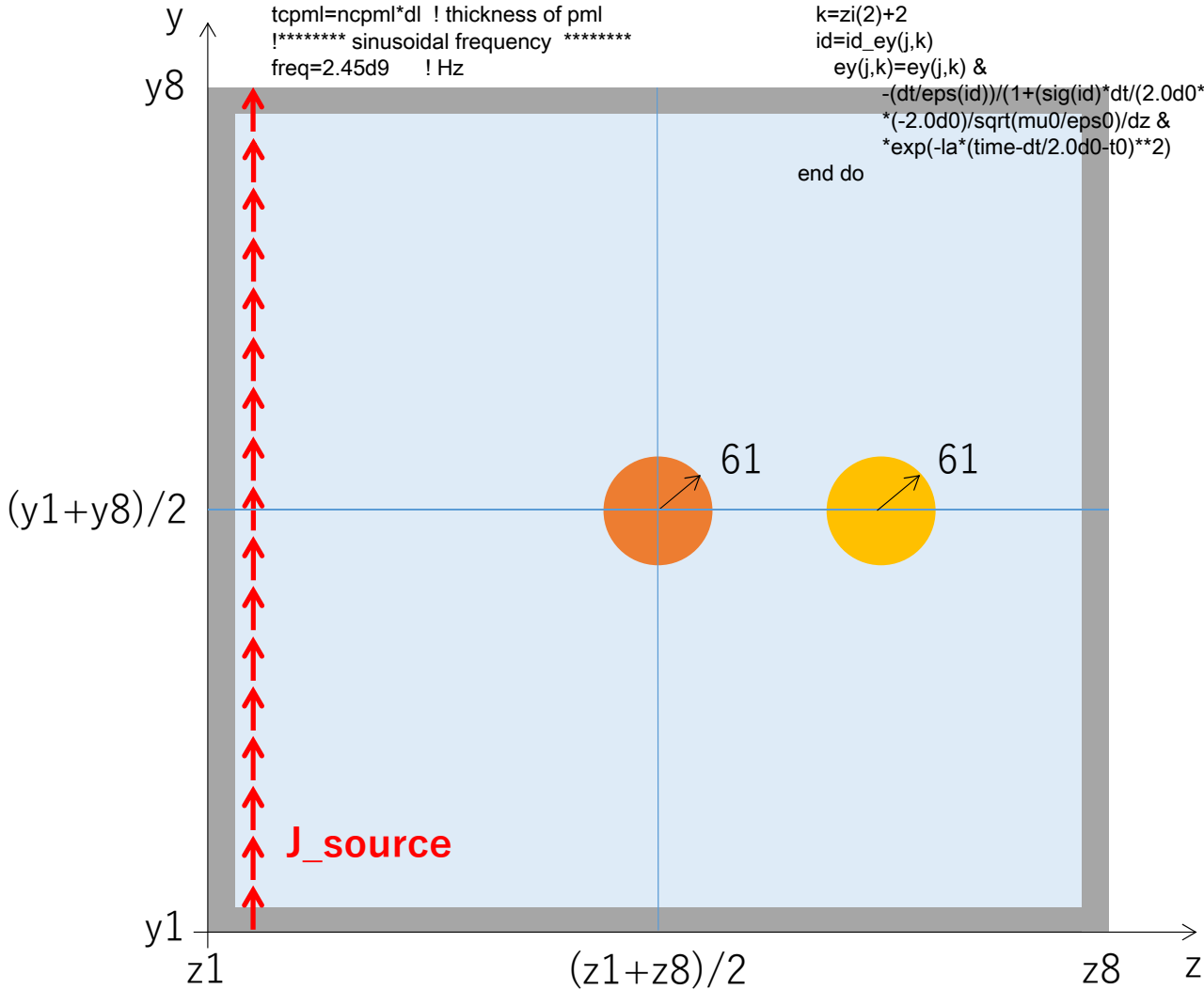


subroutine media_coeff_2dtm
! id=0 vacume
eps(0)=eps0
sig(0)=0.0d0
mu(0)=mu0
! id=1 pec or pmc

! circular media 1
jcent=nint((yi(1)+yi(8))/2.0)
kcent=nint((zi(1)+zi(8))/2.0)
radius=122.0d-3*0.5
call circular_media_1

subroutine circular_media_1
do j=1,iy
do k=1,iz-1
radi=sqrt(((j-jcent)*dy)**2+((k-kcent)*dz)**2)
if(radi <= radius) then
id_ez(j,k)=1
end if
end do
end do
do j=1,iy-1
do k=1,iz
radi=sqrt(((j-jcent)*dy)**2+((k-kcent)*dz)**2)
if(radi <= radius) then
id_ey(j,k)=1
end if
end do
end do

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```

subroutine lattice_time_2dtm
!***** lattice widths *****
dl=2.0d-3
dy=dl
dz=dl
!***** number of cells in pml (ncpml) *****
ncpml=8 ! number of cell in pml
tcpml=ncpml*dl ! thickness of pml
!***** sinusoidal frequency *****
freq=2.45d9 ! Hz

```

```

subroutine j_source_2dtm
!***** for gaussian pulse *****
f_3db=4.0d9
t0=0.646d0/f_3db
la=(1.0d0/0.29d0/t0)**2

do j=yi(1),yi(8)-1 ! for z propagation
  k=zi(2)+2
  id=id_ey(j,k)
  ey(j,k)=ey(j,k) &
    -(dt/eps(id))/(1+(sig(id)*dt/(2.0d0*eps(id)))) &
    *(-2.0d0)/sqrt(mu0/eps0)/dz & ! J [A/m2]
    *exp(-la*(time-dt/2.0d0-t0)**2)
end do

```

```

subroutine media_coeff_2dtm
! id=0 vacume
eps(0)=eps0
sig(0)=0.0d0
mu(0)=mu0
! id=1 pec or pmc

! circular media 2
jcent=nint((yi(1)+yi(8))/2.0)
kcent=nint((zi(1)+zi(8))/2.0)
radius=122.0d-3*0.5
call circular_media_1

! circular media 2
jcent=nint((yi(1)+yi(8))/2.0)
kcent=nint(((zi(1)+zi(8))/2.0+zi(8))/2.0)
radius=122.0d-3*0.5
call circular_media_1

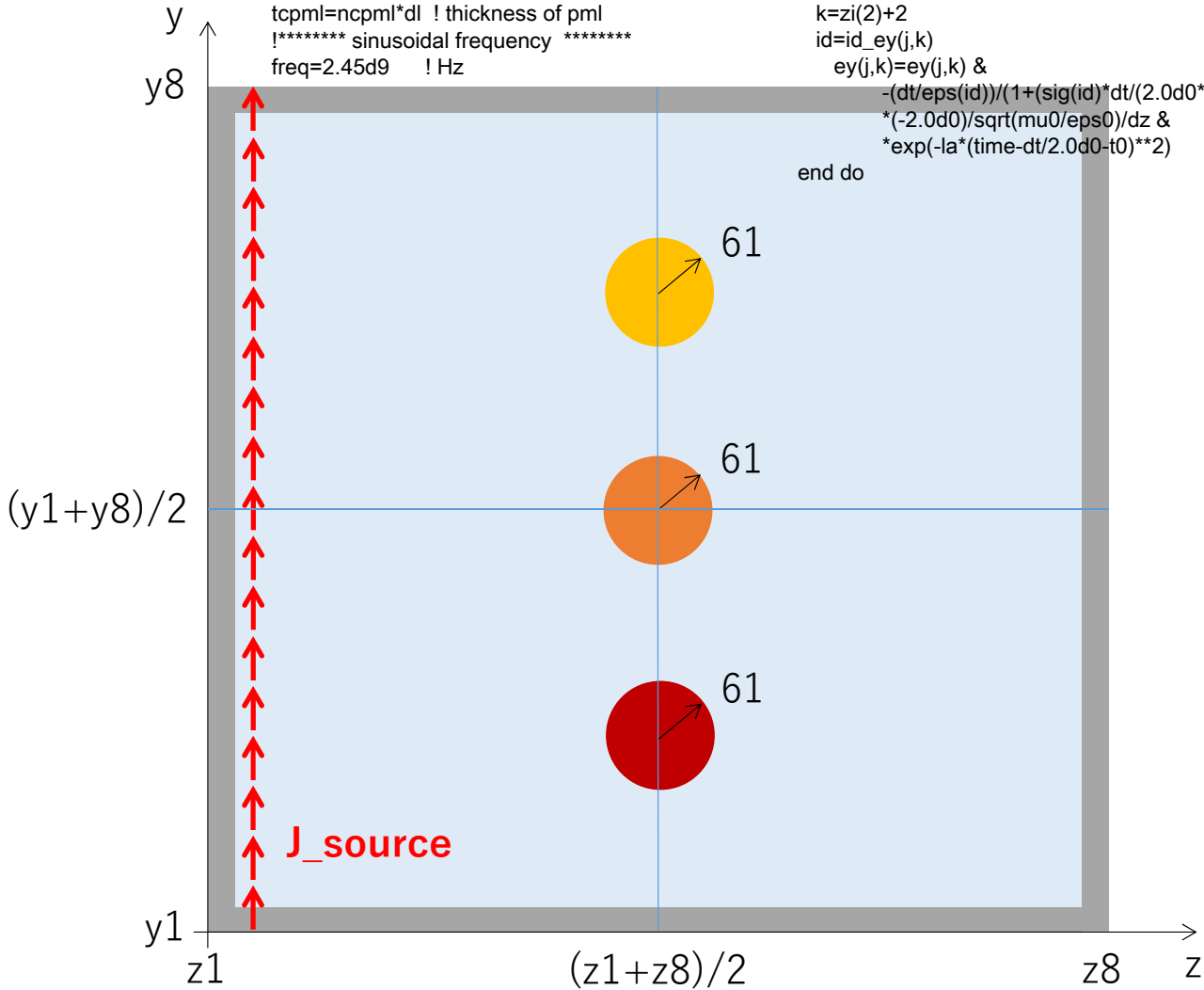
```

```

subroutine circular_media_1
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    if(radi <= radius) then
      id_ez(j,k)=1
    end if
  end do
end do
do j=1,iy-1
  do k=1,iz
    radi=sqrt(((j-jcent)*dy)**2+((k-kcent)*dz)**2)
    if(radi <= radius) then
      id_ey(j,k)=1
    end if
  end do
end do
end do

```

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```

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```

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call circular_media_1

! circular media 2
jcent=nint(((yi(1)+yi(8))/2.0+yi(8))/2.0)
kcent=nint((zi(1)+zi(8))/2.0)
radius=122.0d-3*0.5
call circular_media_1

! circular media 2
jcent=nint(((yi(1)+yi(8))/2.0+yi(1))/2.0)
kcent=nint((zi(1)+zi(8))/2.0)
radius=122.0d-3*0.5
call circular_media_1

```

```

subroutine circular_media_1
do j=1,iy
  do k=1,iz-1
    radi=sqrt(((j-jcent)*dy)**2+((k-kcent)*dz)**2)
    if(radi <= radius) then
      id_ez(j,k)=1
    end if
  end do
end do
do j=1,iy-1
  do k=1,iz
    radi=sqrt(((j-jcent)*dy)**2+((k-kcent)*dz)**2)
    if(radi <= radius) then
      id_ey(j,k)=1
    end if
  end do
end do
end do

```