v1.2 Mar.2016

Scattering
dielectric

subroutine lattice_time_2dtm

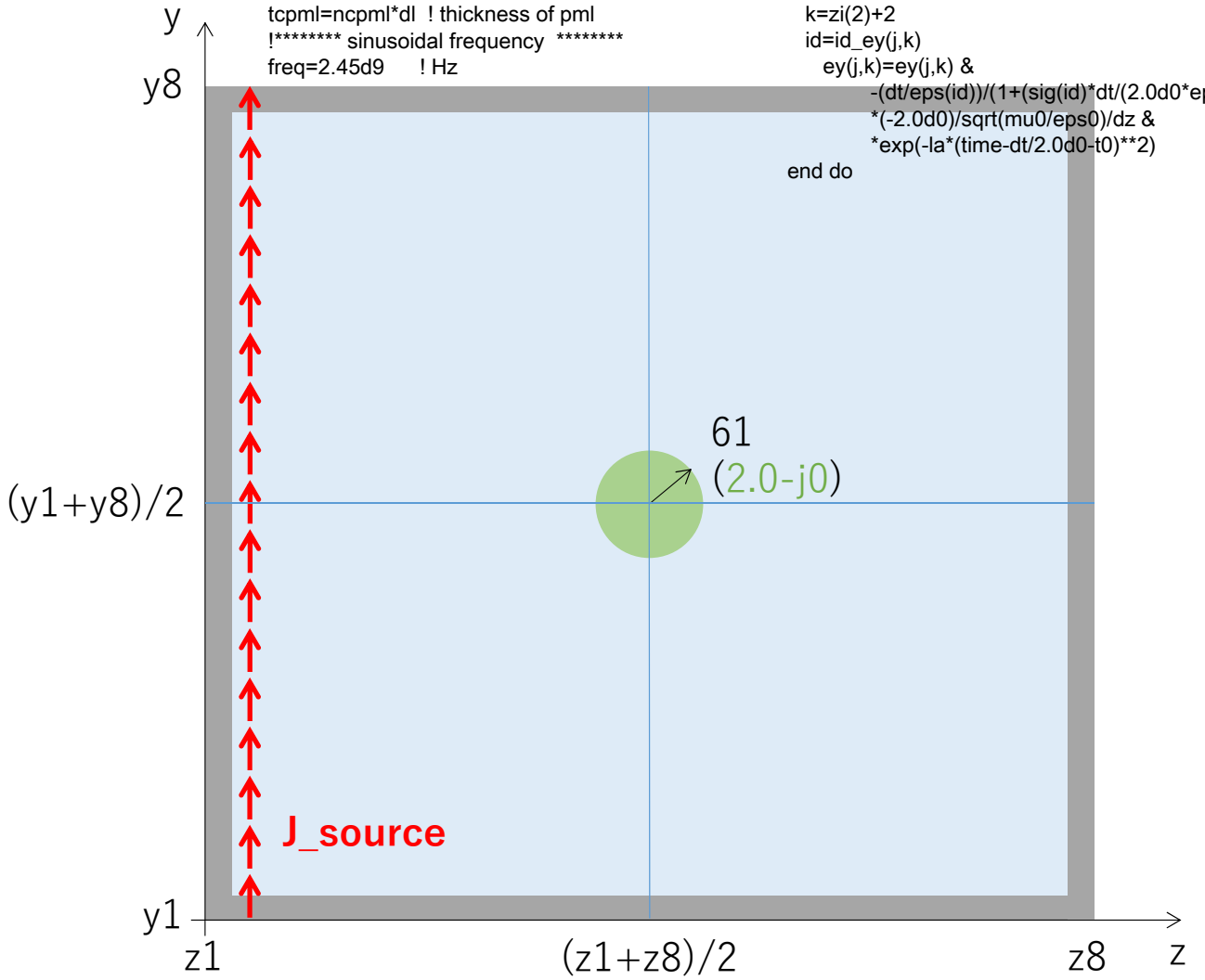
```
!******** lattice widths ********
dl=2.0d-3
dy=dl
dz=dl
!******** number of cells in pml (ncpml) ********
ncpml=8  ! number of cell in pml
tcpml=ncpml*dl  ! thickness of pml
!******** sinusoidal frequency  ********
freq=2.45d9      ! Hz
```

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

   ! id=2 is dielectric media
   eps(2)=eps0*(2.0d0)
   sig(2)=omega*(eps(2)*0.0d0)
   mu(2)=mu0*(0.0d0)

 ! 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_2
```



subroutine circular_media_2

```
  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)=2
        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)=2
        end if
     end do
  end do
```

v1.2 Mar.2016

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subroutine lattice_time_2dtm

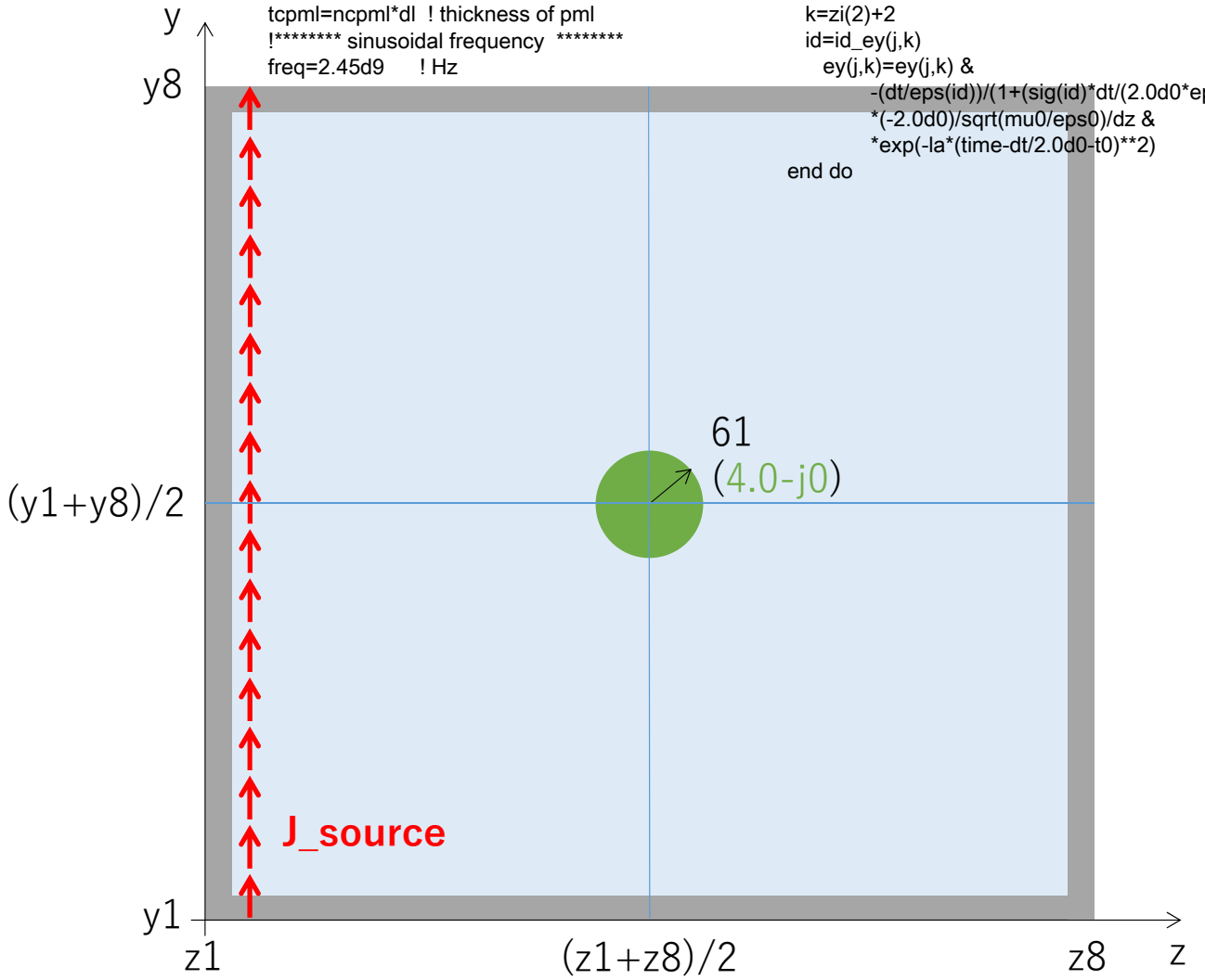
```
!******** lattice widths ********
dl=2.0d-3
dy=dl
dz=dl
!******** number of cells in pml (ncpml) ********
ncpml=8  ! number of cell in pml
tcpml=ncpml*dl  ! thickness of pml
!******** sinusoidal frequency  ********
freq=2.45d9      ! Hz
```

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

   ! id=3 is dielectric media
   eps(3)=eps0*(4.0d0)
   sig(3)=omega*(eps(3)*0.0d0)
   mu(3)=mu0*(0.0d0)

 ! circular media 3
   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_3
```



subroutine circular_media_3

```
  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)=3
        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)=3
        end if
     end do
  end do
```

v1.2 Mar.2016

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subroutine lattice_time_2dtm

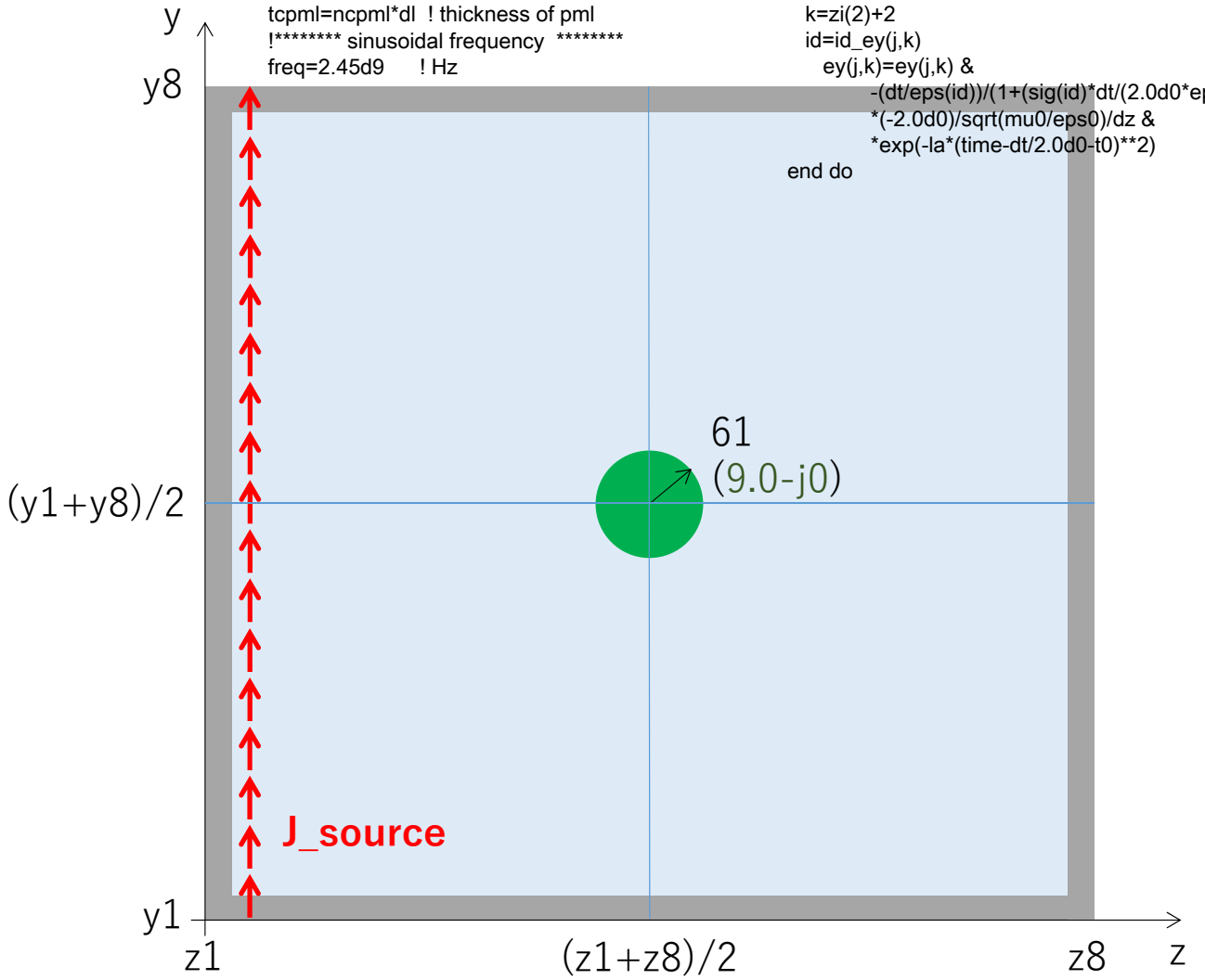
```
!******** lattice widths ********
dl=2.0d-3
dy=dl
dz=dl
!******** number of cells in pml (ncpml) ********
ncpml=8  ! number of cell in pml
tcpml=ncpml*dl  ! thickness of pml
!******** sinusoidal frequency  ********
freq=2.45d9      ! Hz
```

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

   ! id=4 is dielectric media
   eps(4)=eps0*(9.0d0)
   sig(4)=omega*(eps(4)*0.0d0)
   mu(4)=mu0*(0.0d0)

 ! circular media 4
   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_4
```



subroutine circular_media_4

```
  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)=4
        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)=4
        end if
     end do
  end do
```