Bcoeff=(e/me)/mp\*dt\*0.5 = 1.76e11/ {1,3670} \*dt\*0.5

Ecoeff=Bcoeff\*dt

xE=Einterpolate\*Ecoeff

xP=Binterpolate\*Bcoeff

vx=(x-xprev)//vx=x1-x0

xprev=x

x2= x1+ vx +b\_det\*{-vx\*[yyP+zzP]+(vyye\*[zP+xyP]+{xxP\*xE}+xE))}

x += vx + b\_det \* ( -vx \* (yyP + zzP) +

vyye \* (zP + xyP) +

vzze \* (xzP - yP) +

(1.f + xxP) \* xE);

x += vx + b\_det \* ( -vx \* (yyP + zzP) +

(vy + yE) \* (zP + xyP) +

(vz + zE) \* (xzP - yP) +

(1.f + xxP) \* xE);

y += vy + b\_det \* (vxxe \* (xyP - zP) - vy \*

// (xxP + zzP) + vzze \* (xP + yzP) + (1.f + yyP) \* yE);

z += vz + b\_det \*

// (vxxe \* (yP + xzP) + vyye \* (yzP - xP) - vz \* (xxP + yyP) + (1.f \* zzP)

// \* zE);

x2=x1+b\_det ( ( xE + vx ­- vy\*zP + vz\*yP) \* (xxP+1) +

( yE + vx\*zP + vy - vz\*xP) \* (zP+xyP)+

( zE – vx\*yP + vy\*xP + vz ) \* (xzP-yP)

=x1+b\_det(( xE+vx -vy\*zP +vz\*yP) + xE\*xxP +vx\*xxP

x2 = x1+ vx + b\_det \* ( -vx \* (yyP + zzP) +

(vy + yE) \* (zP + xyP) +

(vz + zE) \* (xzP - yP) +

(1.f + xxP) \* xE );

y2=y1+bdet(( yE + vx\*zP + vy - vz\*xP) \*

z2=z1+bdet(( zE – vx\*yP + vy\*xP + vz )

Lorentz force acting on a charged particle with “artificial viscosity” term:

Note:

Discretised approximately as:

Note: keep only lowest order terms. More sophisticated methods keep more higher order terms for accuracy.

Subscript 0,1,2 represents time steps, 12 represents “average” value between time step 1 and 2

Subscript n denotes E normalised to units of velocity, and r and B dimensionless

Where , and and (factor of 2 for B and r is from )

In matrix form (number subscripts are as above not matrix elements)

or

Where and

Without rv

Lorentz force acting on a charged particle with “artificial viscosity” term:

Note:

Discretised approximately as:

Note: keep only lowest order terms. More sophisticated methods keep more higher order terms for accuracy.

Subscript 0,1,2 represents time steps, 12 represents “average” value between time step 1 and 2

Subscript n denotes E normalised to units of velocity, and r and B dimensionless

Where , and and (factor of 2 for B )

In matrix form (number subscripts are as above not matrix elements)

or

Where and