In summary in PIC code,

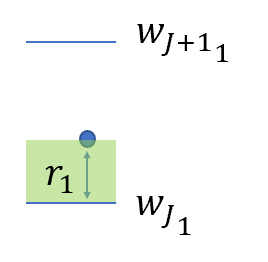
Applying, Marder’s method,

At axis,

**Loading plasma**

The particle weight.

To assign particle positions, assuming two reference particles, the first particle will give density weighting values at the upper grid and lower grid.

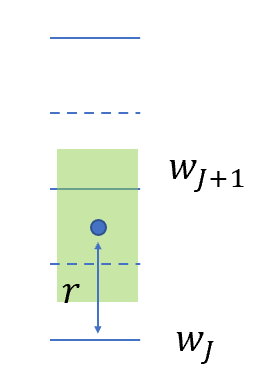


For the second particle, each grid weighting value should be ‘1’.

To check it off again,

So it is same.

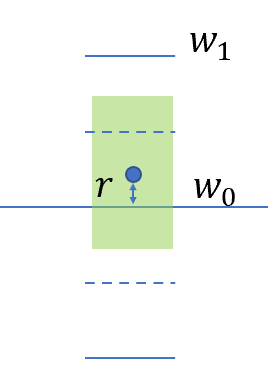
But the base volume of the denominator is dependent on the position r. We try other weighting scheme as below.



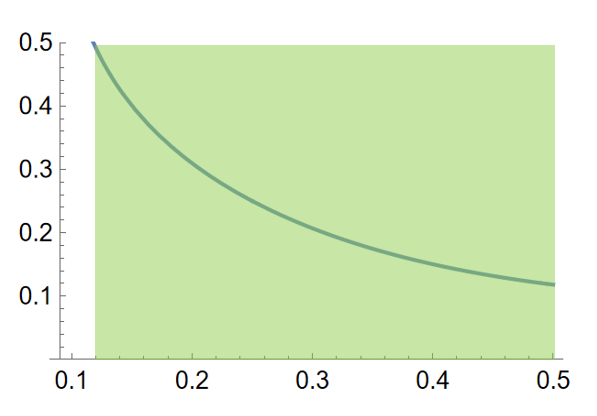
Likewise the second particle will give

At the axis,

If ,

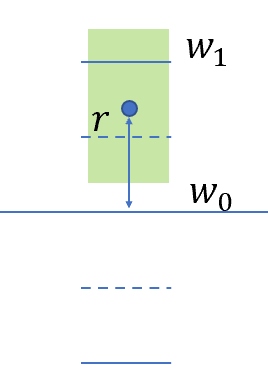


For the second particle,

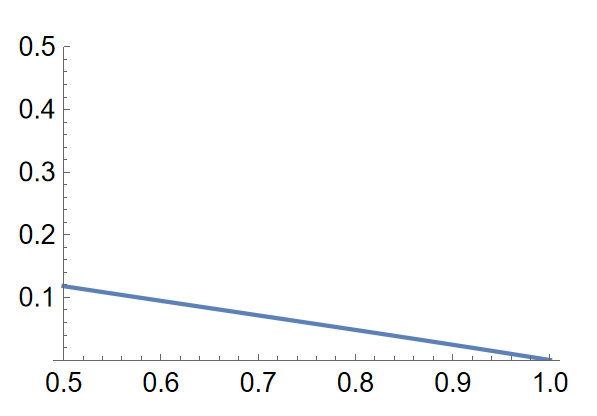


So

If ,



For second particle,



**Laser load.**

Let a vector field,

And a Fourier decomposed field is

Here lets use the unit vector relation.

By equating the vector field and the Fourier decomposed field,

, then

For B field

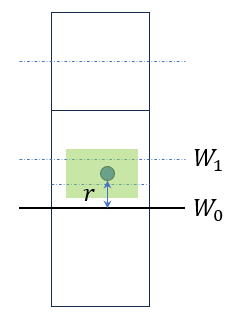
, then

In arbitrary condition,

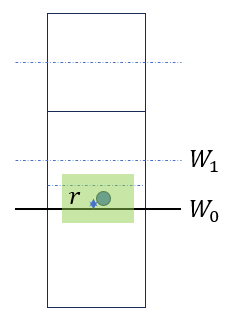
**Interpolation**

When middle points are interpolated,

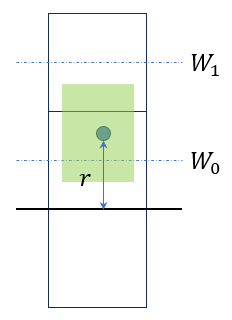
At



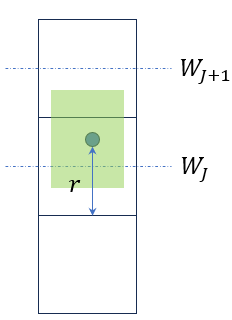
At



At,

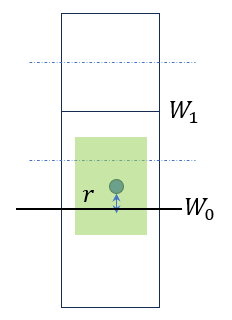


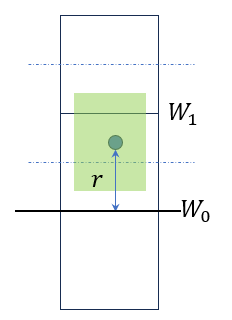
At general point,

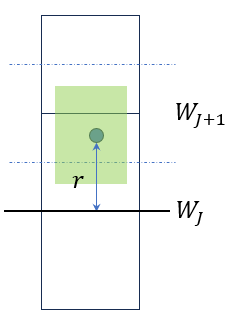


Or

When edge points are interpolated,







**Beam load**

Previous algorithm gives

For m=0;

If we modify Ez field. But not recommend.

At center