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August 25, 2006
Memo for Monday weekly ILC meeting

Potential Well Distortion and Alternative Equilibrium Equations

Summary: Agreement between BMAD and KWM within 3% has been acheived by taking into account potential well distortion and mimicking equilibrium the equations used in KWM.

Potential Well Distortion
The following dependency on current of σ_z/σ_p was extracted from the plots in the paper we have been comparing our results to.

$$\sigma_z/\sigma_p = 10.24 + \frac{2.14}{1.2*10^{10}} * N_b.$$

An author of the paper has confirmed that potential well distortion is indeed present in their simulation results.

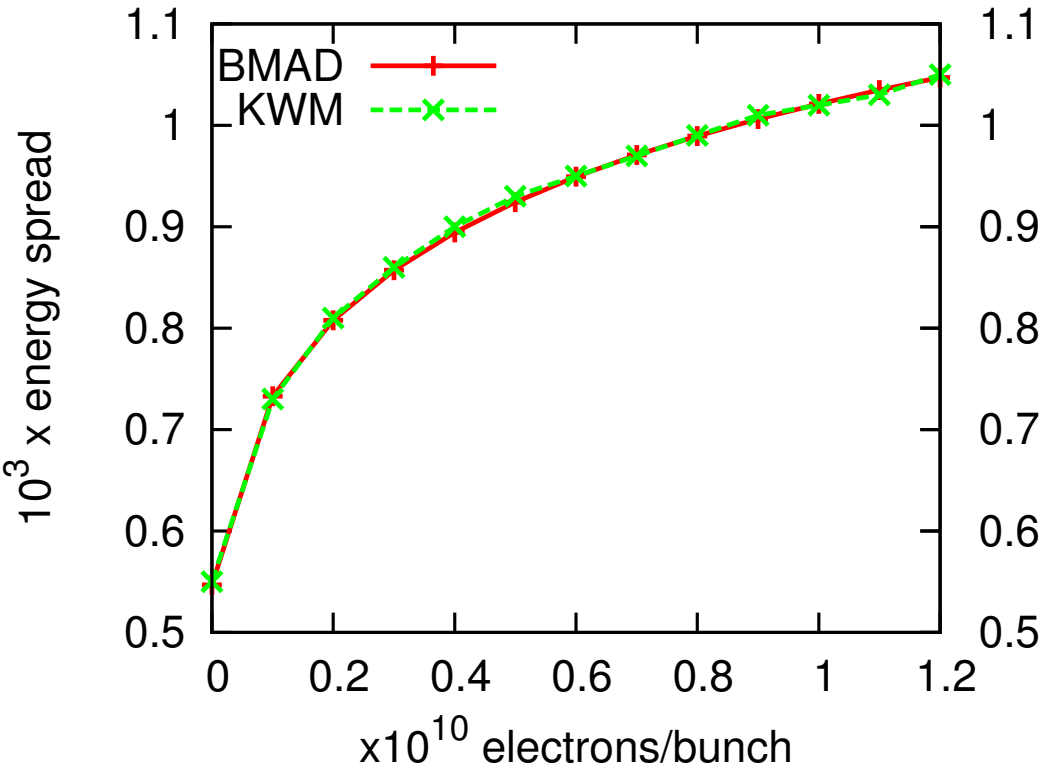
Alternative Equilibrium Equations

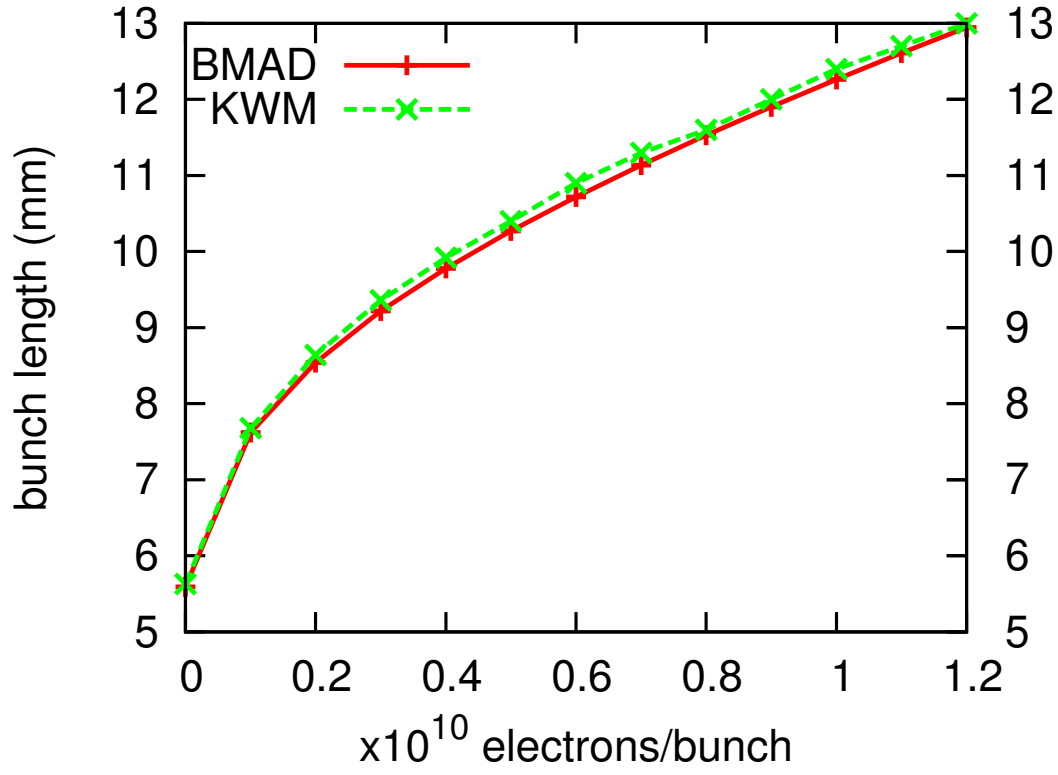
$$\epsilon_v = [(1 - r_e)\frac{T_v}{T_v - \tau_v} + r_e\frac{T_h}{T_h - \tau_h}]\epsilon_{v0},$$

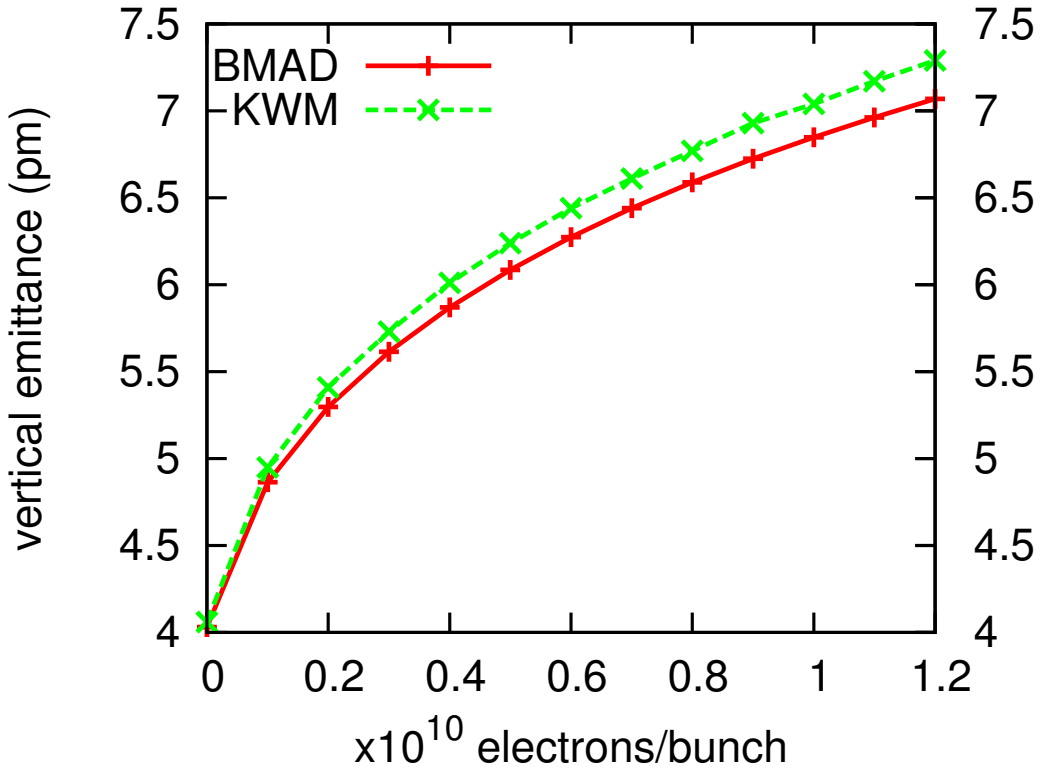
where r_e is the ratio of emittance due to coupling to total emittance.

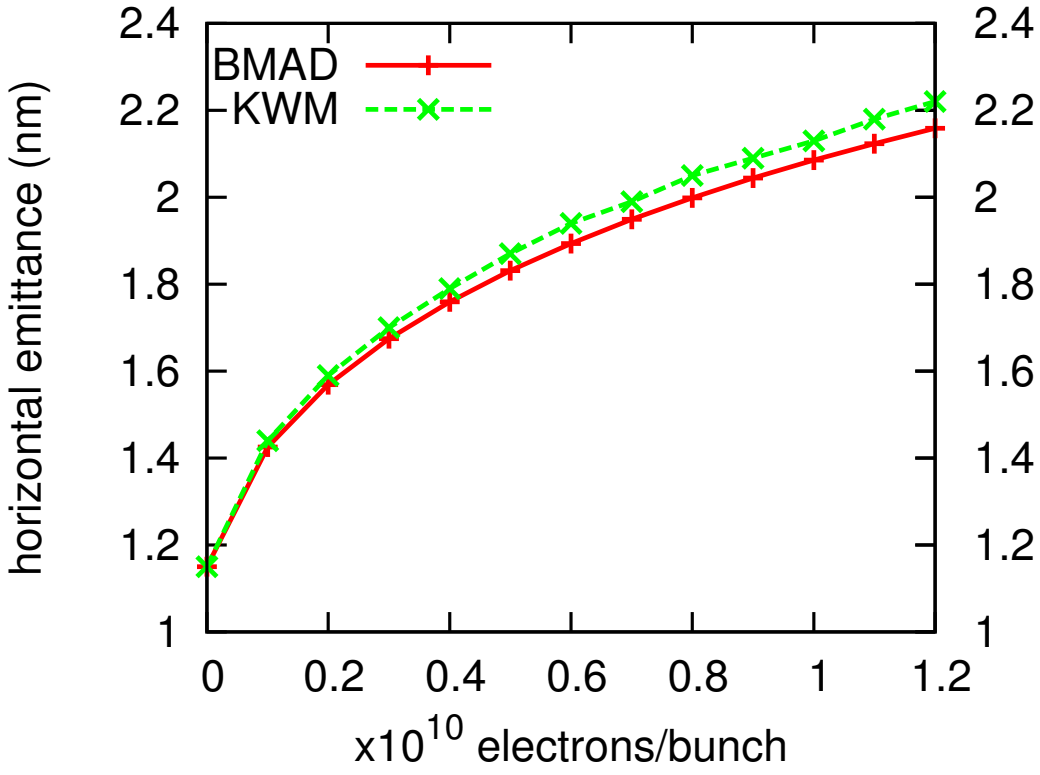
Results
On the two pages that follow are comparison plots. Agreement is within 3%.

In the plots r_e is set to .85 and $\mathcal{H}_v = 5.13 * 10^{-7}$.


BMAD
KWM
10^3 x energy spread
x10^{10} electrons/bunch
1.1
1
0.9
0.8
0.7
0.6
0.5
0
0.2
0.4
0.6
0.8
1
1.2


BMAD
KWM
bunch length (mm)
x10^{10} electrons/bunch
13
12
11
10
9
8
7
6
5
0
0.2
0.4
0.6
0.8
1
1.2


vertical emittance (pm)
BMAD
KWM
7.5
7
6.5
6
5.5
5
4.5
4
0
0.2
0.4
0.6
0.8
1
1.2
x10^10 electrons/bunch


horizontal emittance (nm)
BMAD
KWM
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0
0.2
0.4
0.6
0.8
1
1.2
x10^10 electrons/bunch