EFFECT OF LOWERING BOOSTER ENERGY ON LONGITUDINAL PHASE SPACE BLOWUP

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If the booster energy is reduced from 10 to 8 GeV, with the same time cycle, the effects discussed in FN-187 are affected as follows:

The energy gain per turn eV $\sin\phi_s$ at transition is reduced by a factor .804 to .579 MeV. Assuming (a) that the rf voltage is kept unchanged (assumed to be .8 MeV at transition); (b) that it is reduced by 10%, (c) that it is reduced by a factor of 0.804, and that in all cases the injection bucket is unchanged, we have the following, according to the theory of FN-187:

	Reference design	Case(a)	Case(b)	Case(c)
eV	0.8 MeV	0.8	0.72	.643
$\sin\phi_s$	.900	.724	.804	.900
ϕ_s (degrees)	64.2	46.4	53.5	64.2
θ_o (degrees)	11.1	9.19	10.0	11.5^o
η_o	3.33	3.71	3.71	3.71

Thus the blowup parameter η_o is increased moderately, by about 10%. This should affect the degree of blowup only slightly; the various compensations mentioned in FN-187 should work just about as well.

On the other hand, if alternatives (a) or (b) are chosen, the lower stable phase angle results in a wider stable bucket, and makes considerably larger blowups tolerable as discussed in FN-187. Therefore, in my opinion, a reduction of booster energy to 8 GeV is beneficial provided the rf voltage is kept at 800 GeV or, at most, reduced to 720 GeV.