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Memo for Monday weekly ILC meeting

Exploring the integer tune for CesrTF at 2.0 GeV

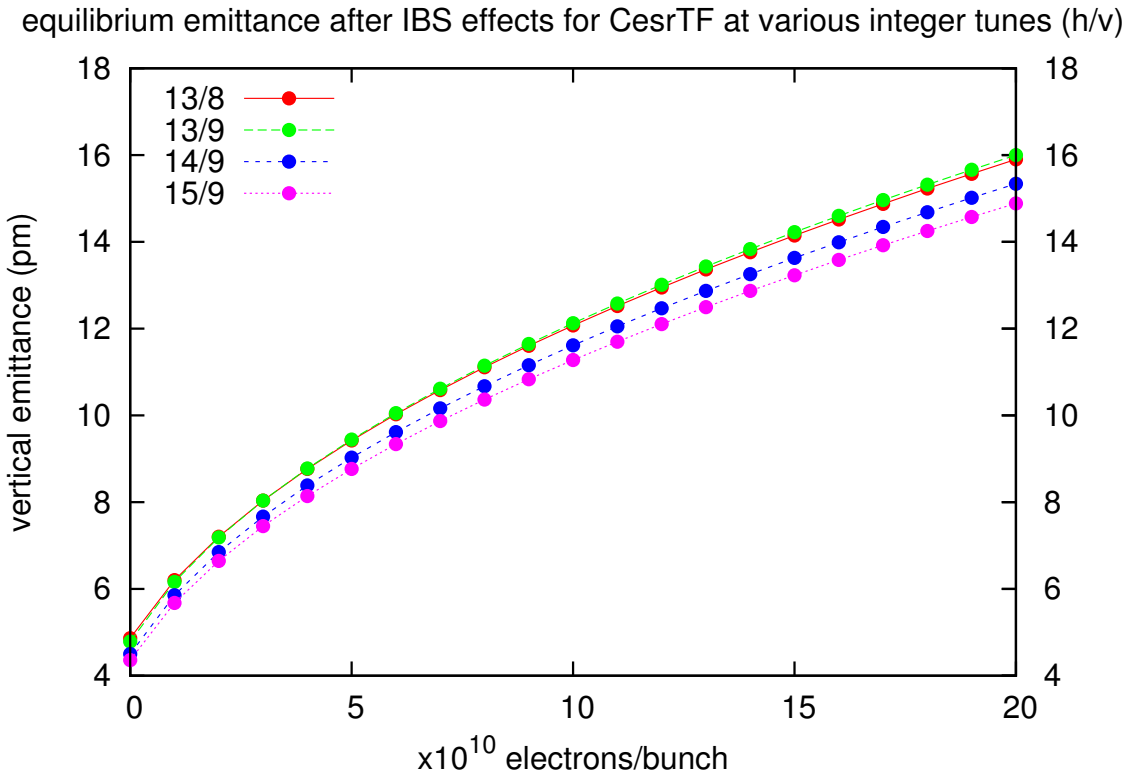
This memo shows the effect of changing the integer tune on equilibrium emittance and RF voltage. The results suggest that a lower tune can be explored without sacrificing too much vertical emittance (e.g. to improve dynamic aperture). The results also suggest that higher tunes could be used to realize shorter bunch lengths if RF voltage becomes a limiting factor.

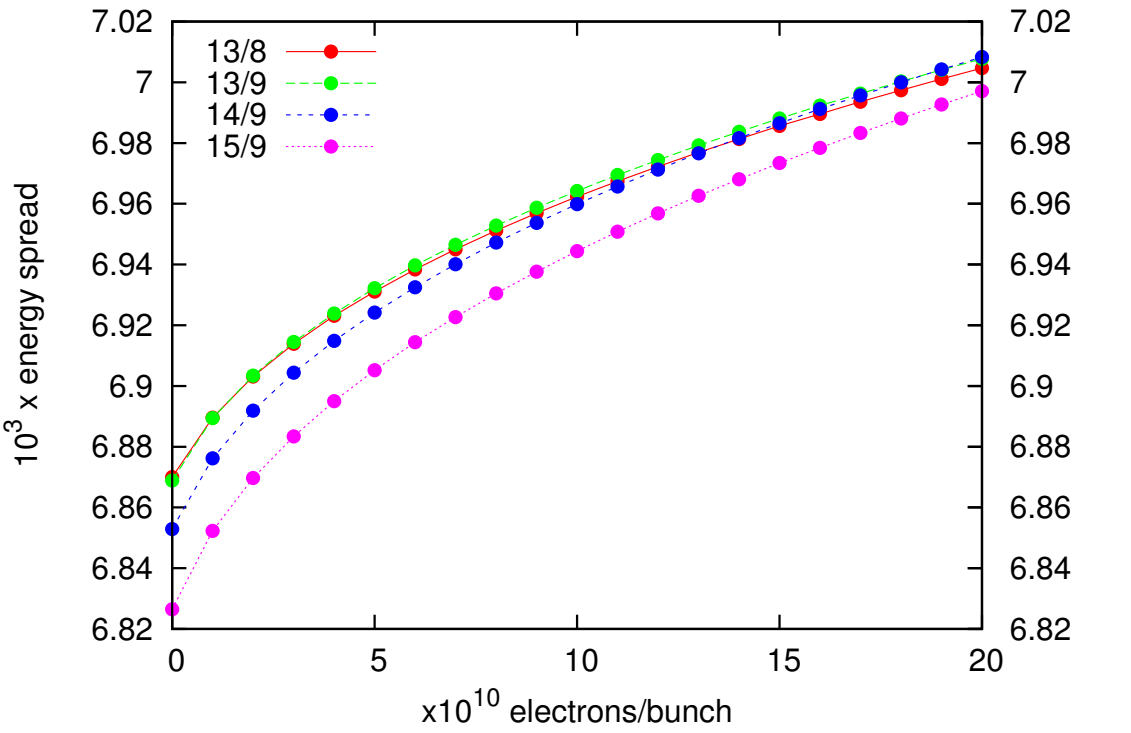
Initial emittance is due to coupling alone. Equilibrium emittance is due to coupling and IBS effects.

integer tune (horiz/ vert)	coupling	initial vertical emittance (pm)	N_{part}	equilibrium vertical emittance (pm)	equilibrum bunch length (mm)	RF Voltage per cavity (MV)
13/8		4.9		15.9	7.0	4.23
13/9		4.8		16.0	7.0	4.22
14/9	.0025	4.5	$2 * 10^{10}$	15.3	7.0	3.70
15/9		4.4		14.9	7.0	3.29
16/9		*		*	7.0	2.94

Table 1: Equilibrium emittances after IBS effects for CesrTF 2.0 GeV at various integer tunes. The 16/9 results are omitted because the lattice is still optimizing. Fractional tune on all lattices is .529 horizontal .580 vertical.

One page follows showing how vertical emittance and energy spread change with particles per bunch.


equilibrium emittance after IBS effects for CesrTF at various integer tunes (h/v)
13/8
13/9
14/9
15/9
vertical emittance (pm)
x10^10 electrons/bunch
18
16
14
12
10
8
6
4
0
5
10
15
20


equilibrium emittance after IBS effects for CesrTF at various integer tunes (h/v)
13/8
13/9
14/9
15/9
10^3 x energy spread
x10^10 electrons/bunch
7.02
7
6.98
6.96
6.94
6.92
6.9
6.88
6.86
6.84
6.82
0
5
10
15
20