

CLIC Parameter working group

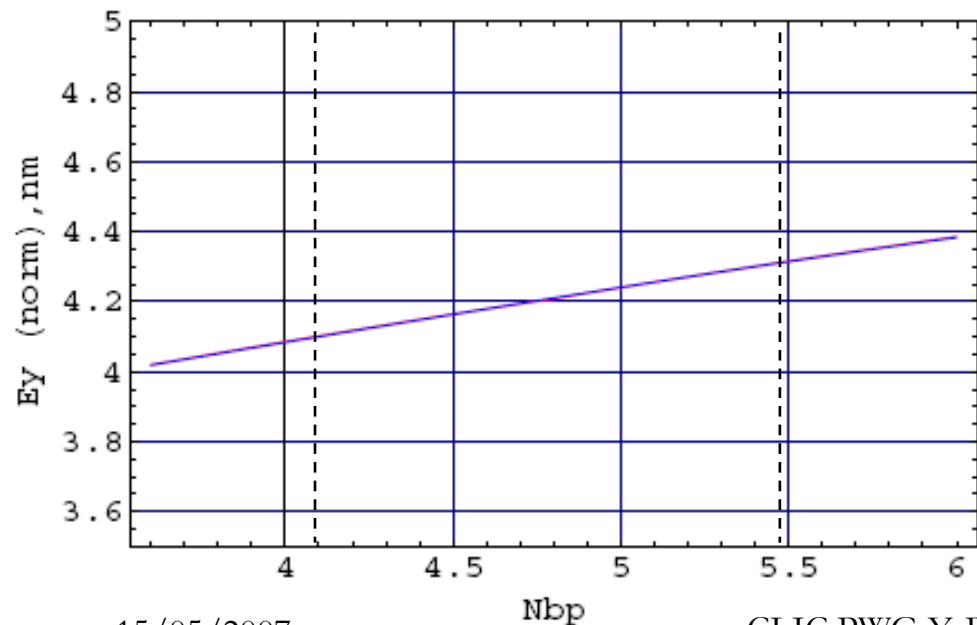
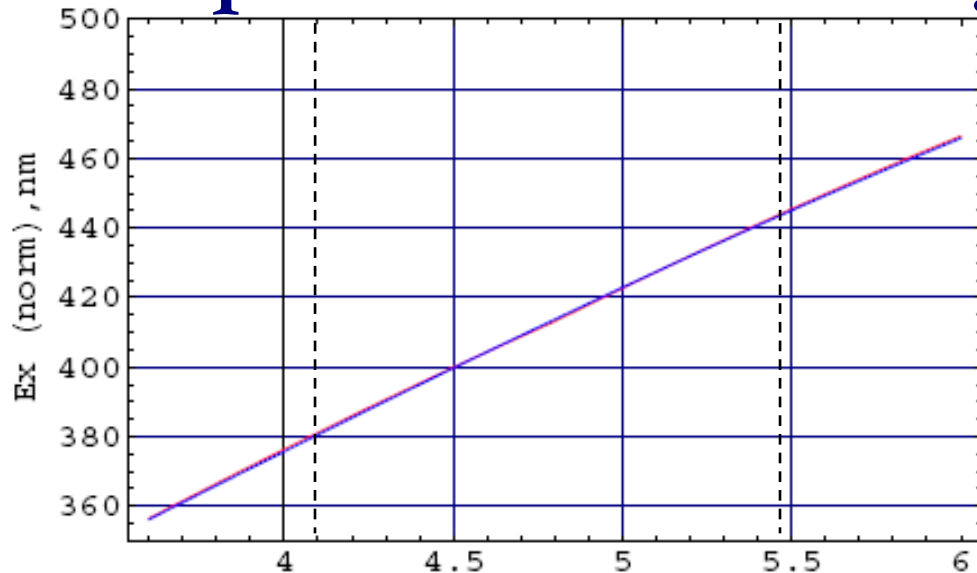


Damping Ring parameters with reduced bunch charge

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Impact of bunch charge



- Almost linear dependence in transverse emittance and more pronounced for the horizontal one
- Bunch population of $5.2 \times 10^9 + 5\% = 5.46 \times 10^9$, $(\epsilon_x, \epsilon_y) = (443, 4.3) \text{ nm}$
- Reduced bunch population of $4.0 \times 10^9 + 5\% = 4.2 \times 10^9$, $(\epsilon_x, \epsilon_y) = (386, 4.1) \text{ nm}$
- Longitudinal emittance kept constant ($\sim 5000 \text{ eV.m}$)

Damping rings' parameter evolution

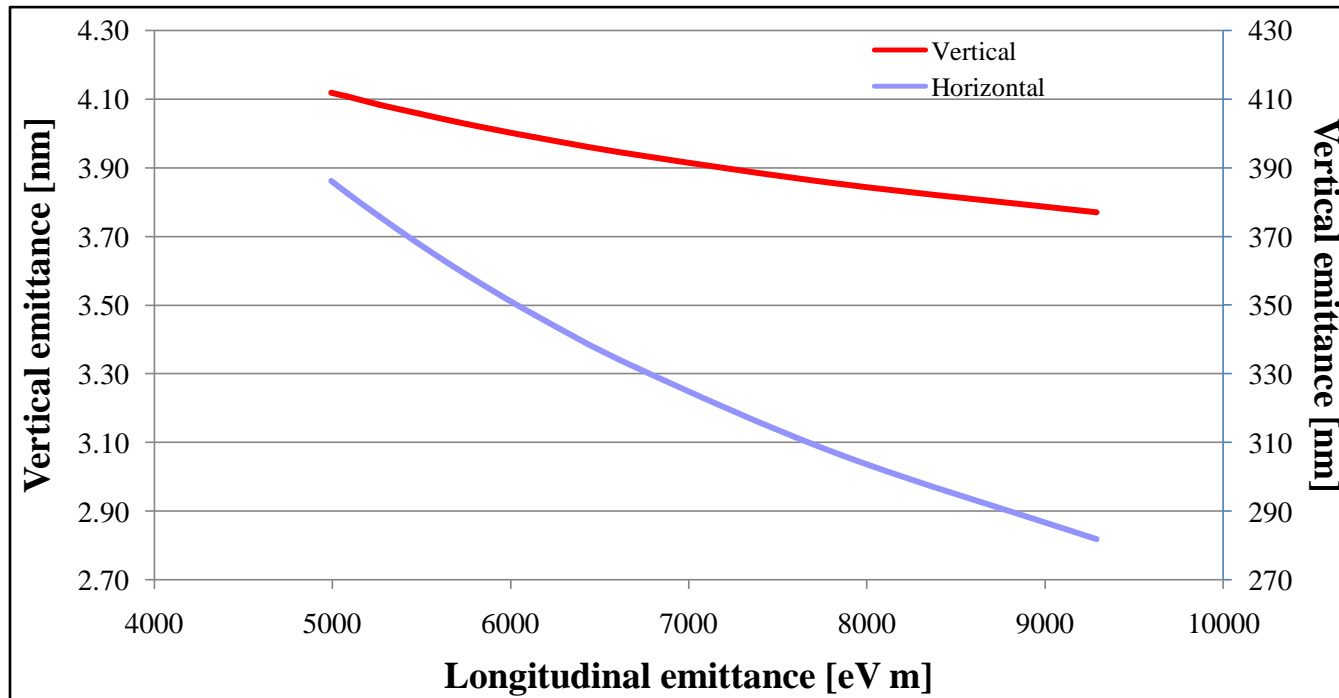
At injection:

- $(\epsilon_x, \epsilon_y) = (60, 1.5) \mu\text{m}$
- $\sigma_s = 10\text{mm}$
- $\sigma_\delta = 0.5\%$

No impact to output parameters

PARAMETER	2005	2006a	2006b	2007a	2007b
energy [GeV]	2.424				
circumference [m]	360	365.2			
bunch population [E+09]	2.56+5%			5.20+5%	4.00+5%
bunch spacing [ns]	0.533			0.667	
number of bunches/train	110			311	
number of trains	4			1	
store time/train [ms]	13.3			20	
rms bunch length [mm]	1.55	1.51	1.59	1.49	1.53
rms momentum spread [%]	0.126	0.136	0.130	0.138	0.135
hor. normalized emittance [nm]	540	380	308	443	386
ver. normalized emittance [nm]	3.4	2.4	3.9	4.3	4.1
lon. normalized emittance [eV.m]	4725	5000	4982	4998	4993
(horizontal, vertical) tunes	(69.82, 34.86)	(69.82, 33.80)			
coupling [%]	0.6		0.13		
ver. dispersion invariant [μm]	0		0.248		
wiggler field [T]	1.7	2.5			
wiggler period [cm]	10	5			
energy loss/turn [MeV]	2.074	3.903			
hor./ver./lon./ damping times [ms]	2.8/2.8/1.4	1.5/1.5/0.75			
RF Voltage [MV]	2.39	4.25	4.185	4.345	4.280
number of RF cycles	2			1	
repetition rate [Hz]	150			50	
RF frequency [GHz]	1.875			1.499	

Dependence on longitudinal emittance



- By relaxing the requirement of 5000 eV.m in the longitudinal emittance to around 8000 eV.m
 - Horizontal emittance can be reduced to below 300nm
 - Vertical emittance can be reduced to below 3.9nm