

# Damping Ring parameters for the new accelerating structure

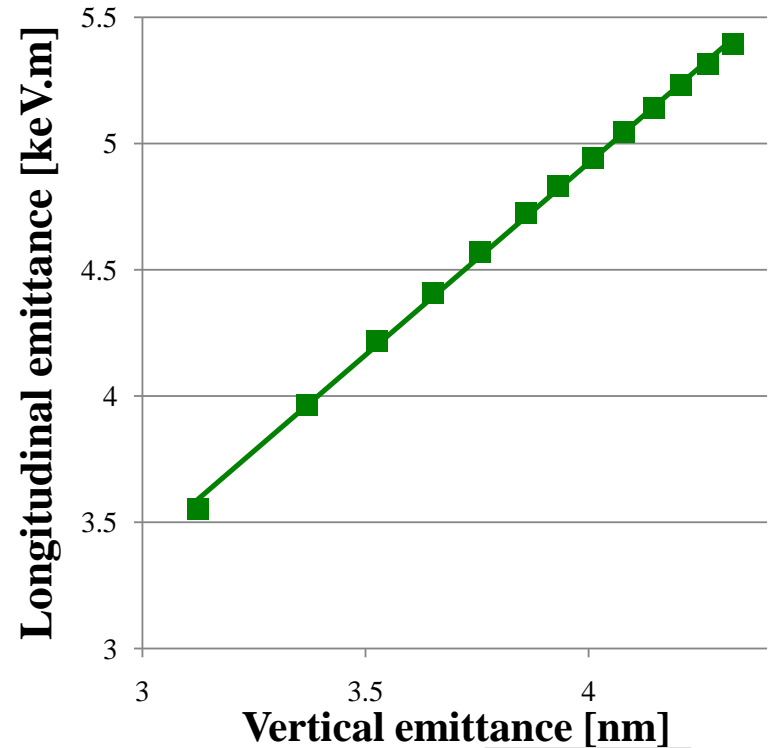
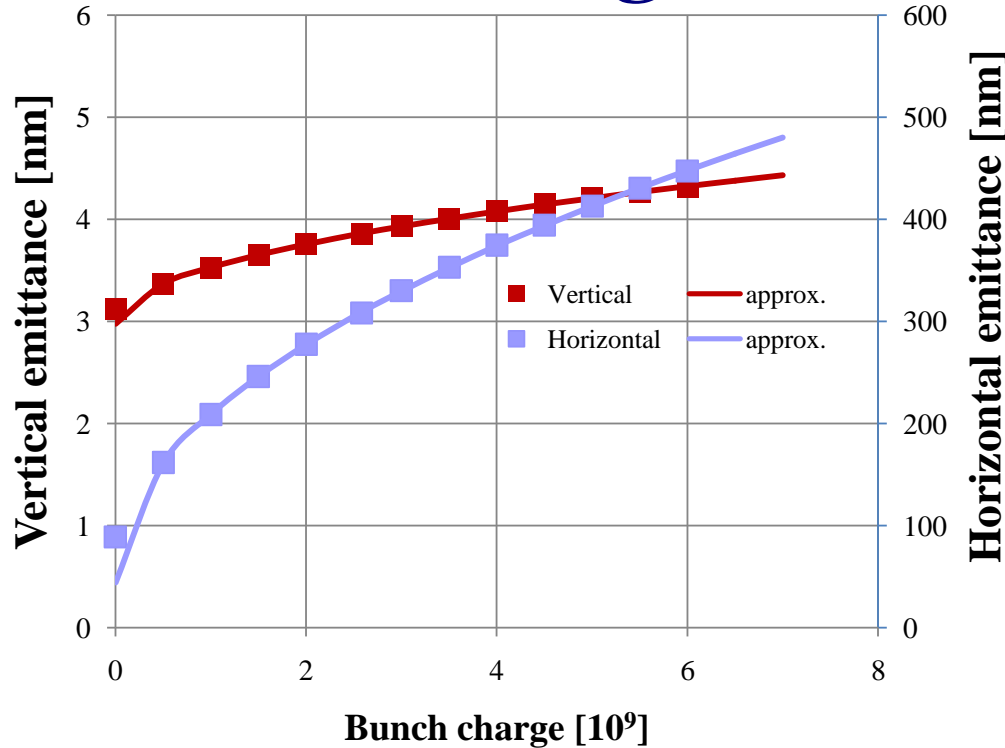
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# New parameters from CLIC\_G structure

- Bunch population  $3.72 \times 10^9 + 10\% = 4.1 \times 10^9$  (vs.  $4 \times 10^9 + 10\% = 4.4 \times 10^9$ )
  - Small impact in transverse emittance (mostly horizontal)
- Bunch spacing of 6 RF cycles, i.e. 0.5ns (vs. 0.667ns)
  - RF frequency of 2GHz (vs. 1.5GHz)
  - $e^-$ -cloud effects become more severe
- Number of bunches is roughly the same (316 vs. 311)
  - 13% of the ring circumference filled
- The repetition rate is unchanged
  - The store time remains comfortably long (20ms)
- Longitudinal emittance kept below 5000eV.m to fit bunch compressor requirements

# Bunch charge



- The horizontal normalized emittance scales as  $\gamma\epsilon_x \propto \sqrt{N_b/\sigma_z}$
- The above relationship is even more exact when the longitudinal emittance is kept constant
- Vertical and longitudinal emittance are weakly dependent on bunch charge, and almost linear with each other

# Damping rings' parameter evolution

■ 2005: original ring

■ 2006a: super-conducting wiggler considered

■ 2006b: vertical dispersion included

■ 2007a: 12GHz structure

■ 2007b: reduced bunch population

■ 2007c: CLIC\_G structure

PARAMETER	2005	2006a	2006b	2007a	2007b	2007c
energy [GeV]	2.424					
circumference [m]	360	365.2				
bunch population [E+09]	2.56+5%			5.20+5%	4.00+10%	3.70+10%
bunch spacing [ns]	0.533			0.667		0.500
number of bunches/train	110			311		316
number of trains	4			1		1
store time/train [ms]	13.3			20		20
rms bunch length [mm]	1.55	1.51	1.59	1.49	1.53	1.53
rms momentum spread [%]	0.126	0.136	0.130	0.138	0.135	0.134
hor. normalized emittance [nm]	540	380	308	455	395	381
ver. normalized emittance [nm]	3.4	2.4	3.9	4.4	4.2	4.1
lon. normalized emittance [eV.m]	4725	5000	4982	4998	4993	4996
(horizontal, vertical) tunes	(69.82, 34.86)		(69.82, 33.80)			
coupling [%]	0.6			0.13		
ver. dispersion invariant [ $\mu\text{m}$ ]	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	4.115
number of RF cycles	2			1		
repetition rate [Hz]	150			50		
RF frequency [GHz]	1.875			1.499		2.00