

An Alternative RCS Solution: RF Cycle 20 Hz / $h=1$

RF Voltage is dominated by the
required bunch area and not by $B\dot{\omega}$
-> Same RF voltage (60 kV) works also at 20 Hz

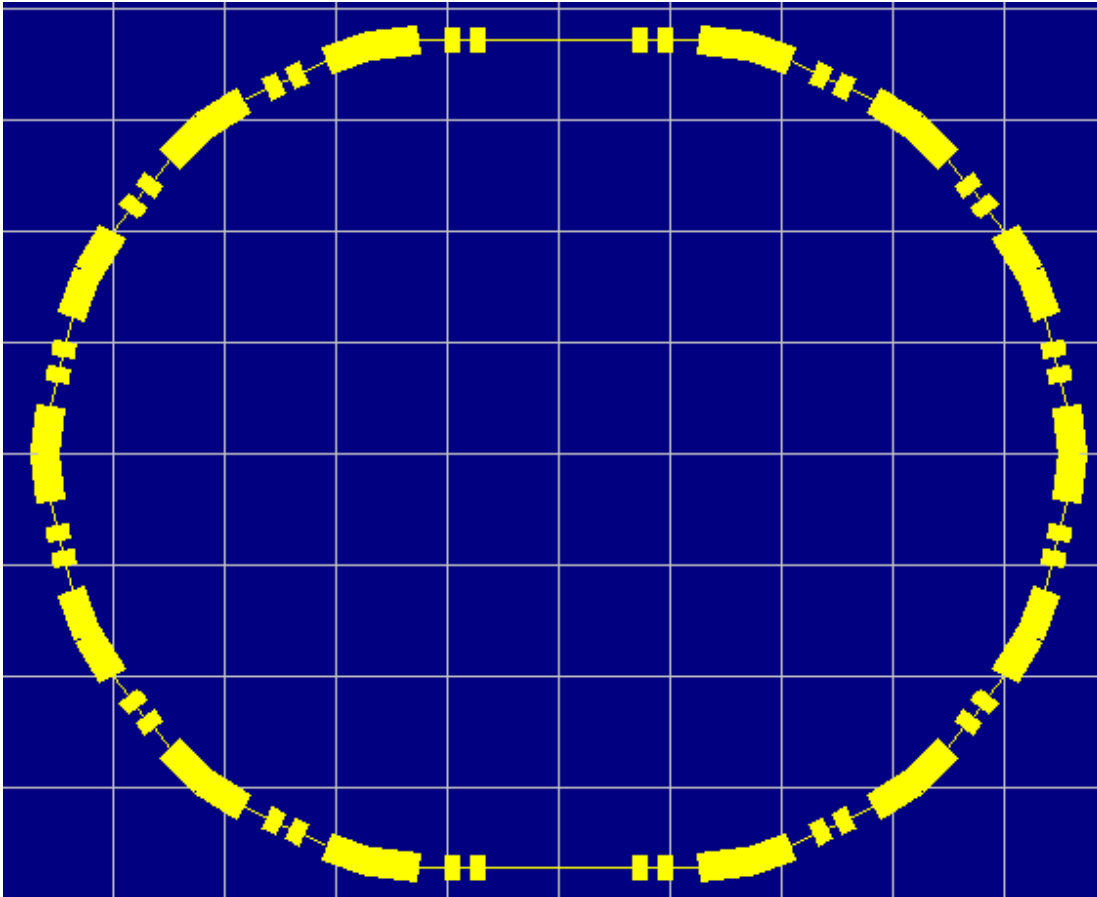
Example: Racetrack Lattice
 $C = 107.7\text{m}$
(NB. No Circumference Restrictions for $h=1$)

LHC Beam (=Bunch) Parameters

RCS Bunch = ~ 4 x final LHC Bunch

- $N_p = 1.04 \text{ E}12$
- $\varepsilon_{n, \text{rms}} = 2.5 \text{ mm mrad}$ in x, y
- $\varepsilon_L = 1.6 \text{ eVs}$

Example RCS Lattice

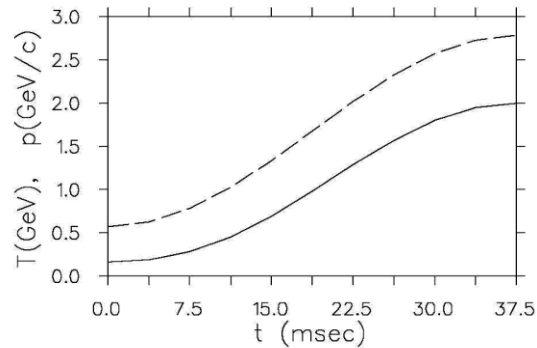


$C = 107.712 \text{ m}$
16 Cells, Cell Tune = $2/7$
LongSS $D=D'=0$, $L=5.3\text{m}$
 $B_{\text{max}} = 1.226 \text{ T}$
 $B'_{\text{max}} = 13.8 \text{ T/m}$
 $L_{\text{bend}} = 3.4\text{m}$
 $L_{\text{quad}} = 0.5\text{m}$

Magnet Cycle, RF Voltage

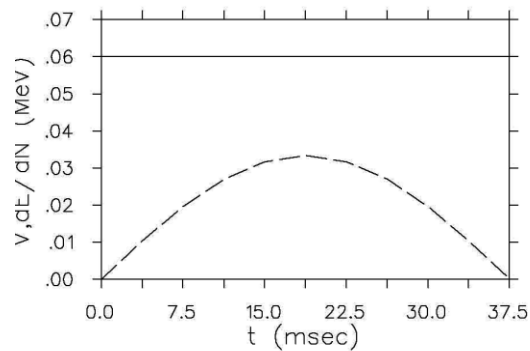
Magnet Cycle: Sinusoidal , Rise Fraction =0.75

VRF=60 kV const.



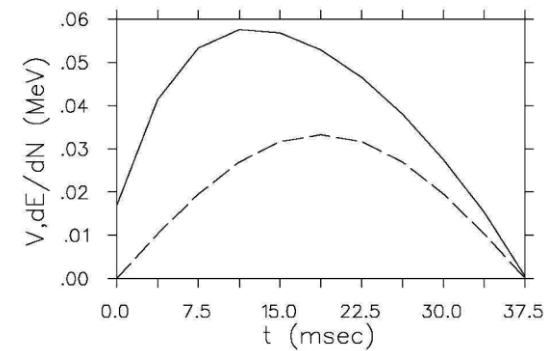
- Field Law : $p \sim B$

Fill Factor = 0.95 const.



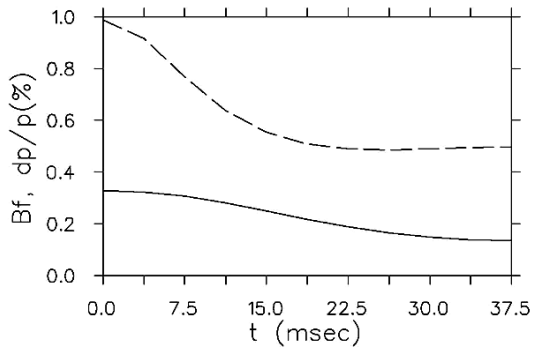
RF Voltage (MV)

dE/turn (MV)



Bunch Height, Bunching Factor Space-Charge Tune Shift dQ_x, dQ_z

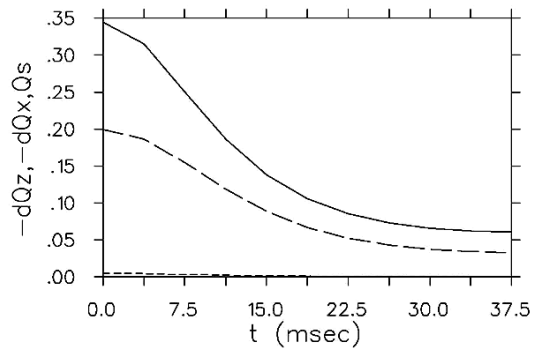
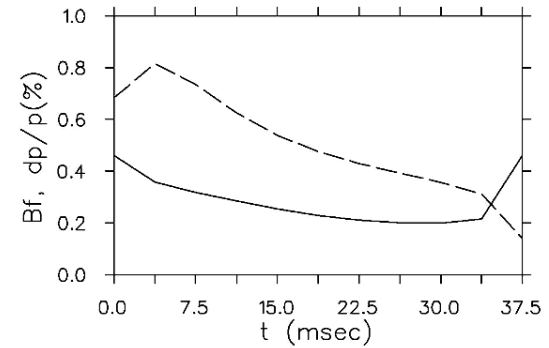
VRF=60 kV const.



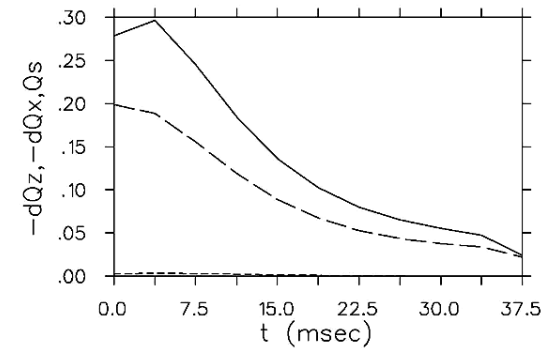
Bunch 1/2height %

Bunching Factor

Fill Factor = 0.95 const.



$-dQ_x, -dQ_z$



Some Arguments for Harmonic Number $h=1$ and higher Rep-rate

PRO:

- $h = 1$ is most flexible – can adapt to all future evolutions
- $h=1$ -> circumference not bound to PS circumference numerology
- RF frequency is within range of Finemet cavities
- Linac4 structure capable of 50Hz
- Only one bunch -> less space charge tune-shift for given bunch intensity
- Relaxed rise time for extraction kickers

OPEN questions:

- Max. $B\dot{\omega}$ a problem for power converters?
- Eddy currents – metallic vacuum chamber feasible?
- ISOLDE limits?
- ?