Science & Technology Facilities Council

KURNS experiment proposal

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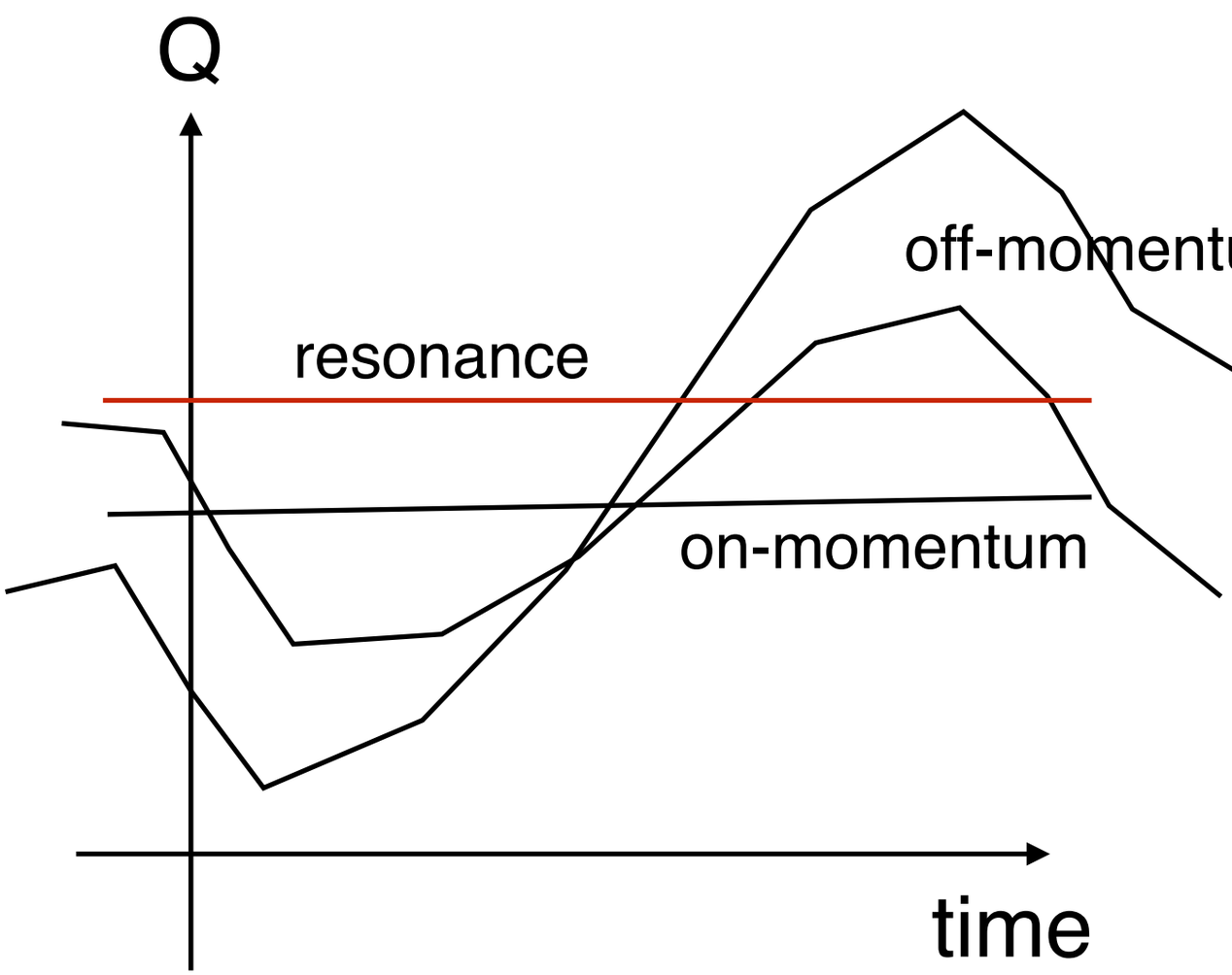
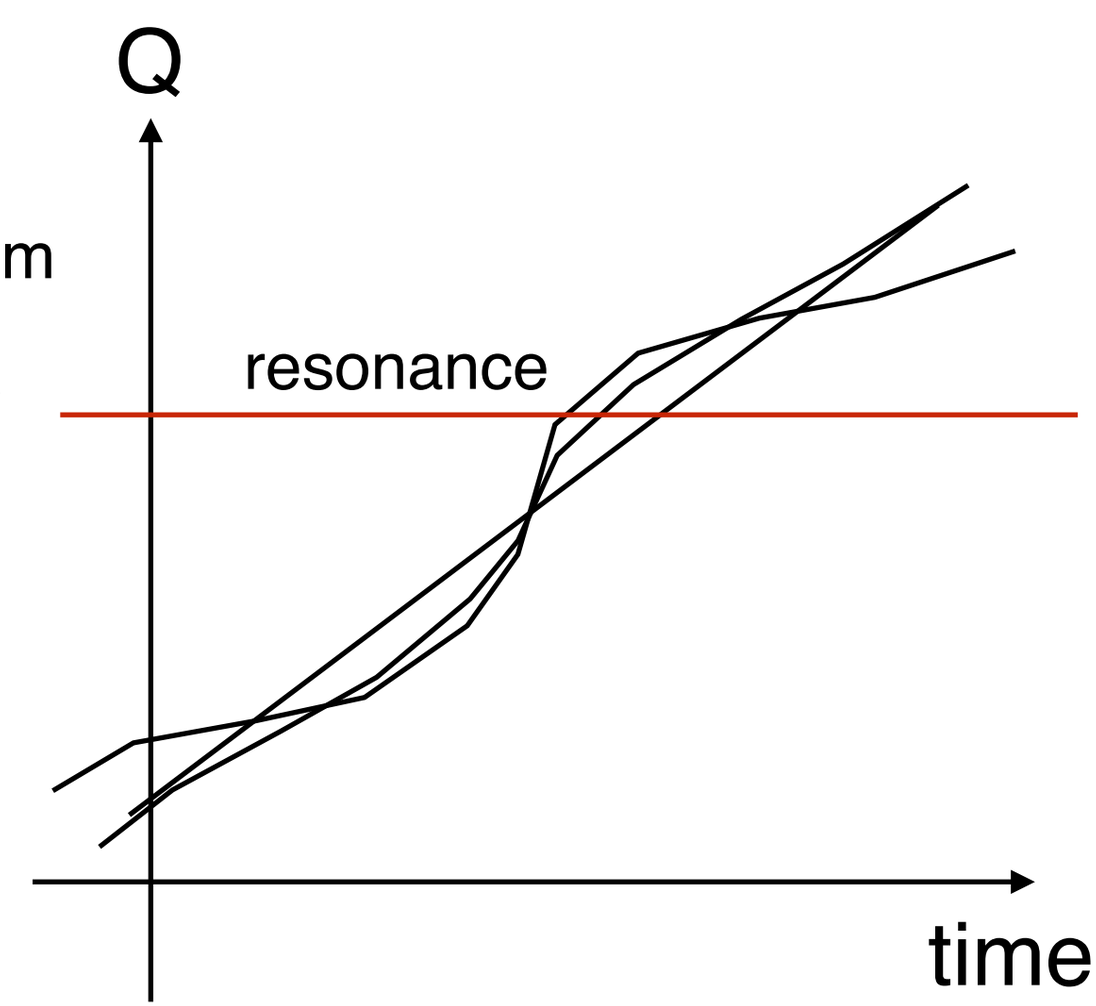
So far no improvement

- In the extreme limit when the tune is sit around a resonance.
  - We should not see any difference depending on the amount of dp/p
- On the other extreme end, when the tune change so fast
  - We should not see any difference depending on the amount of dp/p
- Are we in the right situation we assumed?

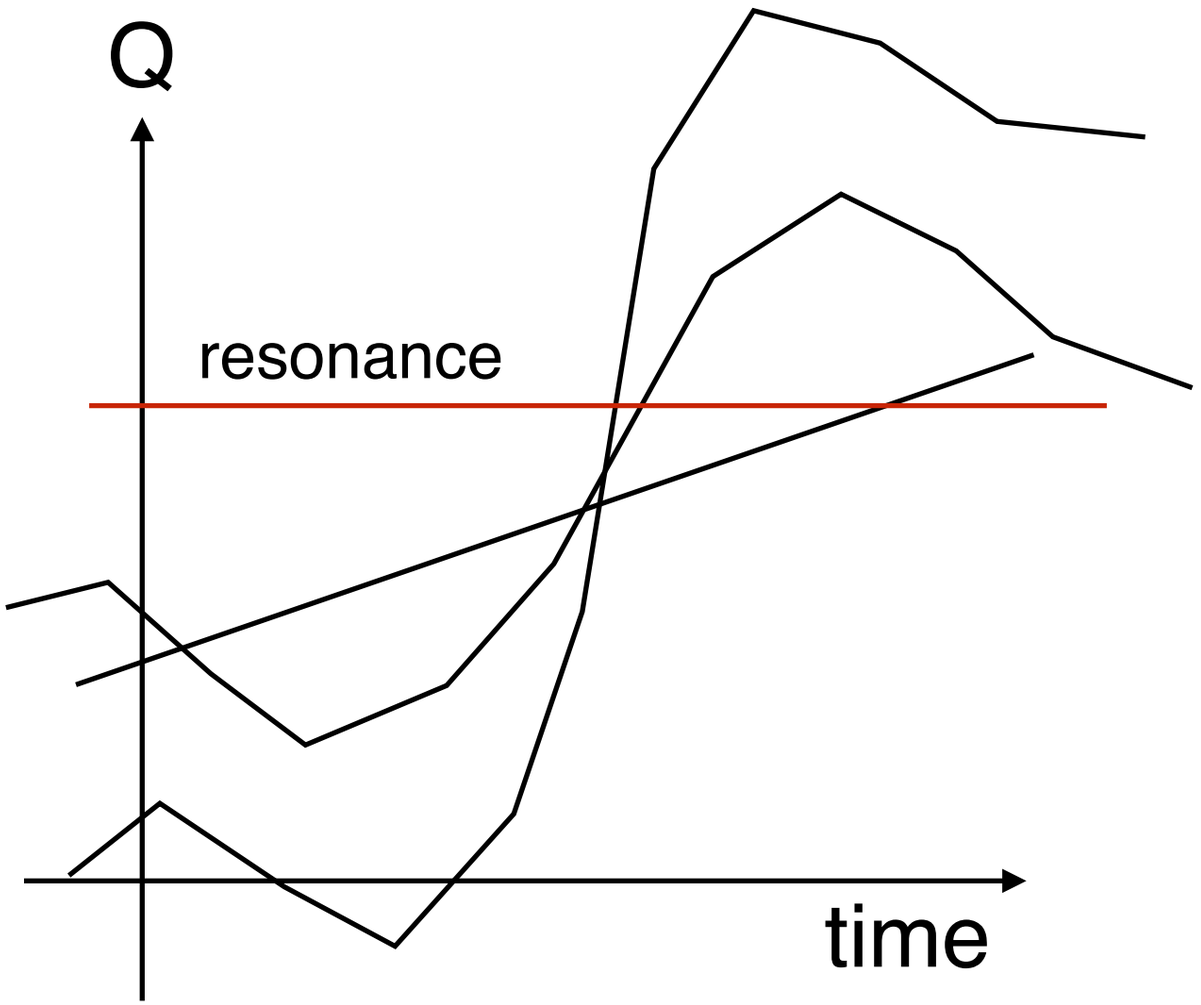
So far no improvement

- Large or small dp/p does not make any difference in terms of the number of crossing.





So far no improvement



Condition

dQ_off ~ dQ_on in one synchrotron period

So far no improvement

- There may be a certain speed which makes the difference between large and small dp/p maximum.

- Adiabatically change phis and voltage keeping the bucket height constant before the resonance. Compare beam loss with/without phase jump at several acceleration speed.

- ~ 2-3 days?
  - Establish amount of phase jump and timing.
  - Compare bunch length and see the clear difference.
  - Data taking with different acceleration speed.

Backup

So far no improvement

dE/t = f_r V sin(\phi_s) = 1.37e3 MV/s
dQ/t = (3.87-3.65)/10 ms = 22 1/s
t_syn = 200 turns x 1e-6 = 2e-4 s
dp/p = 0.005

dQ = \xi dp/p = \xi (dE/E) /2
\xi = 2 E dQ/dE = 2 E (dQ/t) / (dE/t) = 0.64
where E = 20 MeV

Within one synchrotron oscillation
dQ = dQ/t t_syn = **4.4e-3** for on-momentum particle
dQ = \xi dp/p = 0.64 0.005 = **3.2e-3** for off-momentum particle

We should see improvement if dp/p is reduced!

So far no improvement

- Change acceleration rate: dE/t
  - When the beam approach the resonance.
- Change synchrotron frequency keeping dE/t
  - Reducing voltage means lower bucket size.