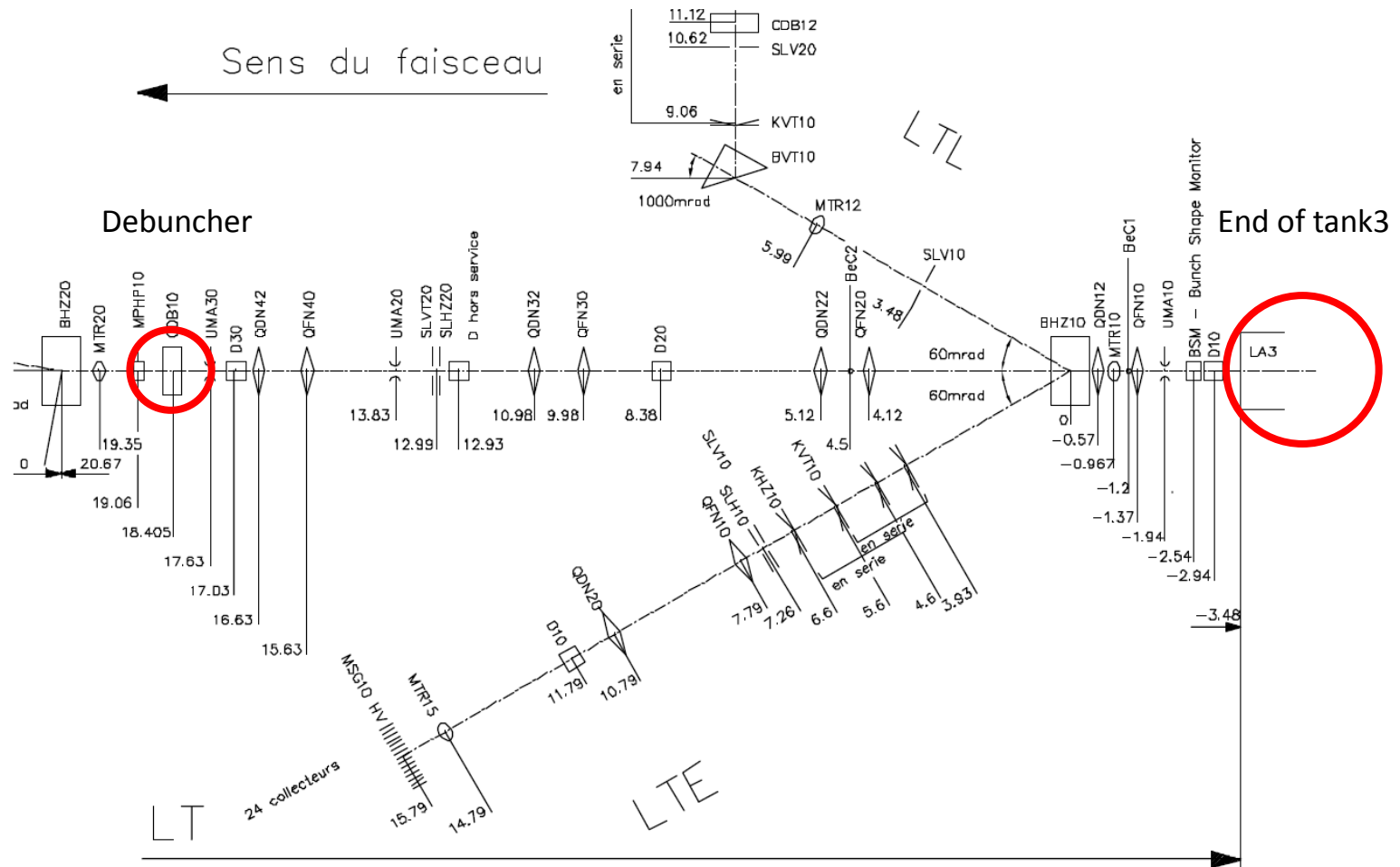


Linac2 – CDB10 « (De)buncher cavity »

Giulia Bellodi – JB Lallement

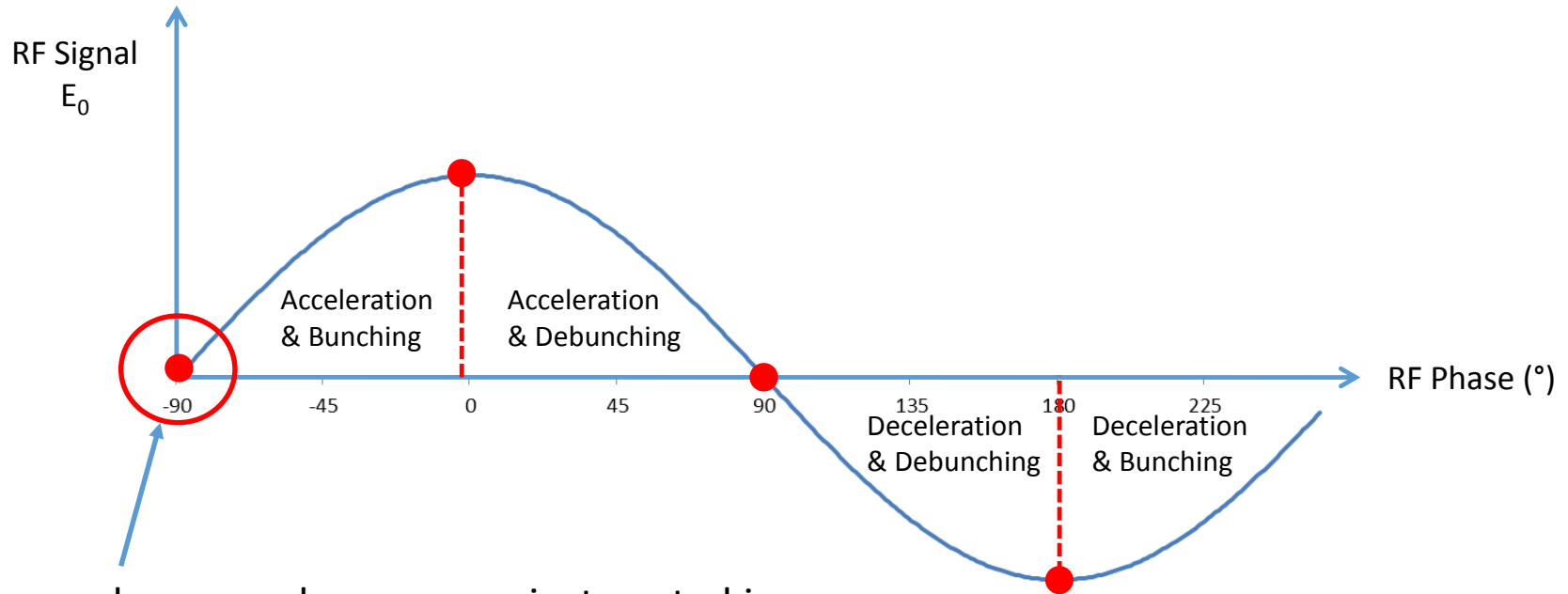
17/07/2015

What are we talking about ?



- No further acceleration after tank3 -> beam at 50 MeV constant energy.
- The buncher cavity should not accelerate or decelerate the beam
 - Just there to reduce the energy spread

Few words on buncher cavities



The synchronous phase we are interested in.
-90° (linac convention).

No energy gain

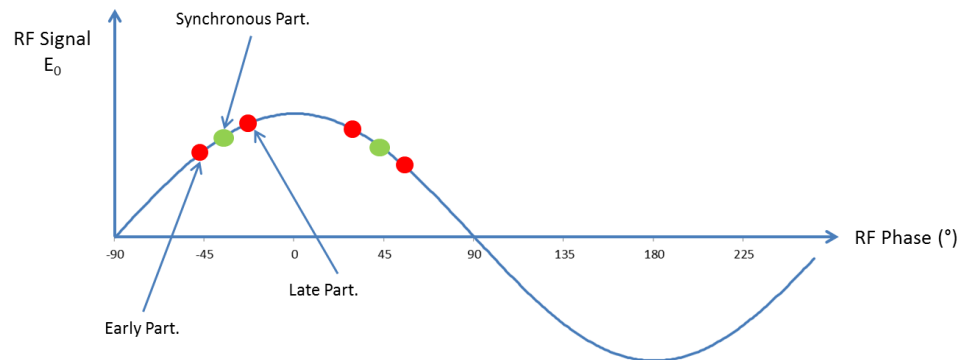
Increase slope of the RF voltage.

Resulting in pure bunching:

Late particles are accelerated

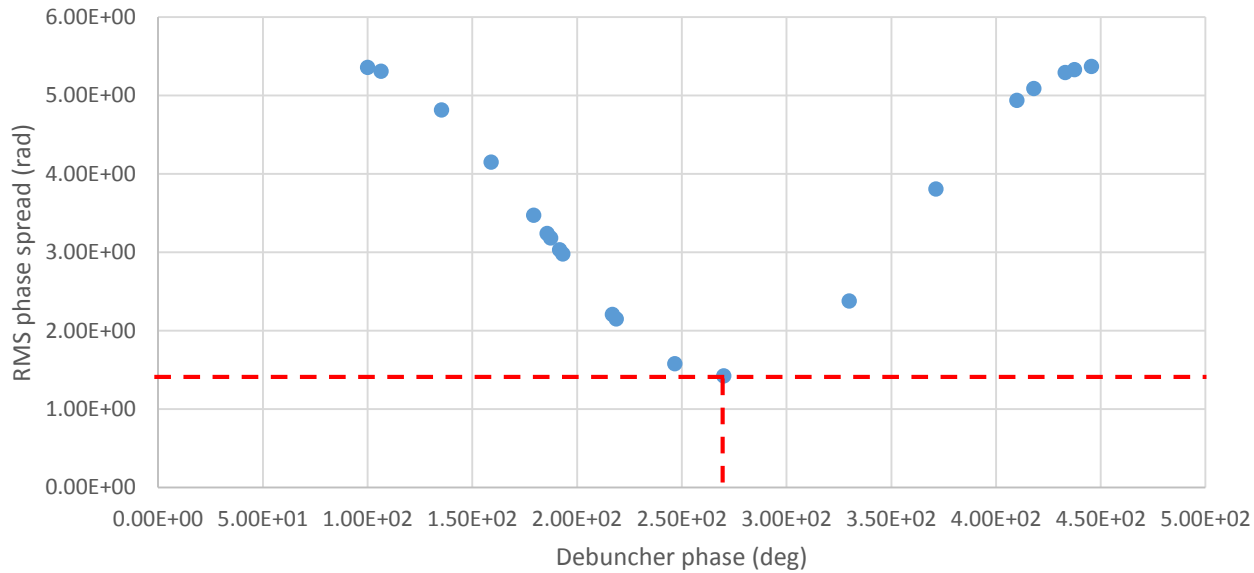
Early particles are decelerated

The energy spread is decreased



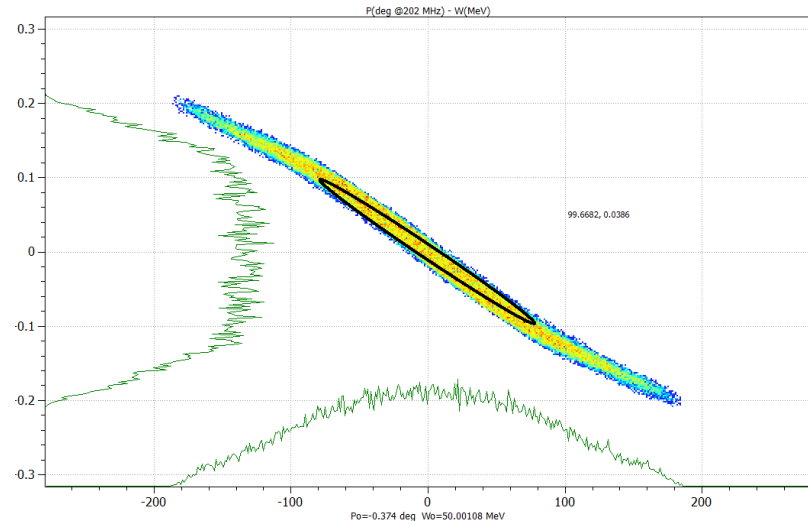
Scanning the CDB10 phase

Bunch phase RMS [rad] downstream BI.QN60 vs CDB10 phase

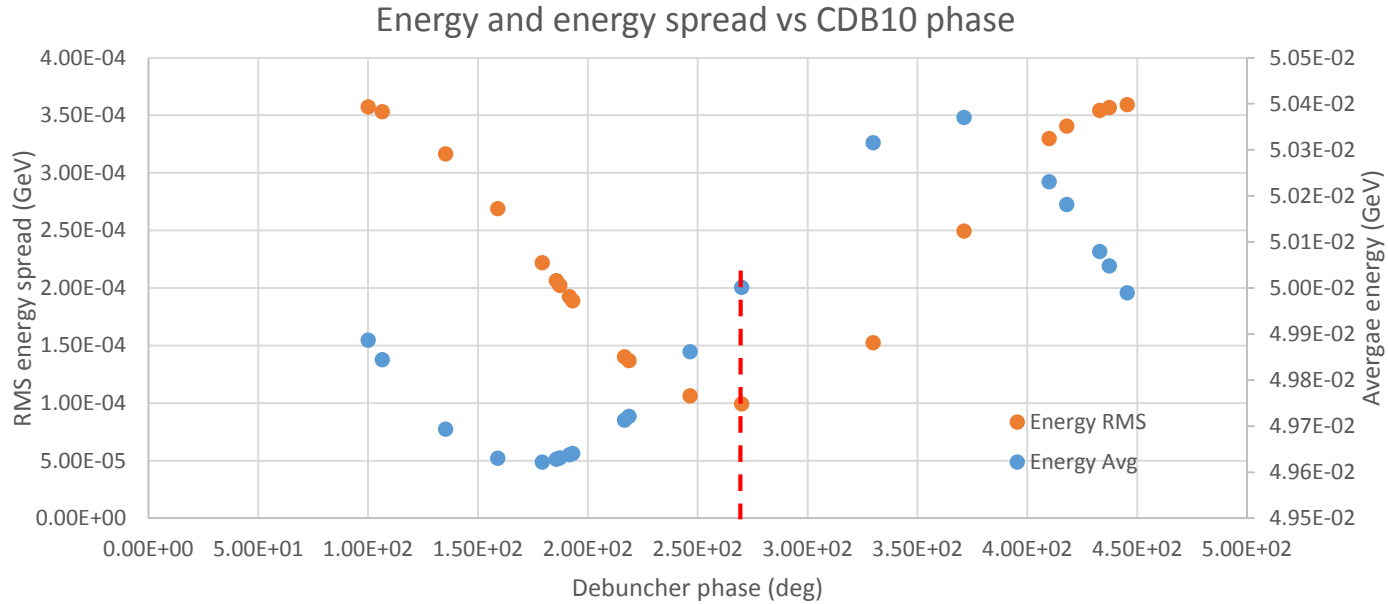


As expected, minimum bunch length at the bunching phase $\rightarrow -90^\circ = 270^\circ$.
 Any other synchronous phase would give longer bunches.

Longitudinal phase space downstream BI.QN60.
 Bunch length is $\pm 180^\circ$ almost completely
 « debunched ».
 An overlap between two consecutive bunches is
 possible.

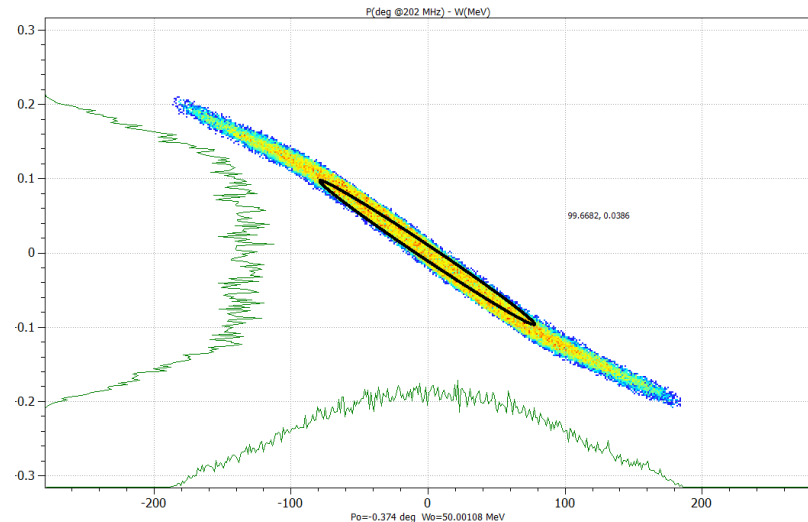


Scanning the CDB10 phase



As expected, minimum energy spread (orange points) at -90°
 No energy gain - > 50 MeV

Longitudinal phase space downstream BI.QN60.
 Bunch length is $\pm 180^\circ$ almost completely
 « debunched ».
 An overlap between two consecutive bunches is
 possible.



Scanning the CDB10 phase

The MD took place on May 27th

CDB10 phase was scanned between 257.6° and 302.4° (45° range)

At 150 mA and 70 mA beam currents.

(Control system reference - step of 5.6°)

From the RF side:

Impossible to go out of this range – No power margin

No beam loading at 274.4° - This is bunching or debunching phase

From the LBS side (energy and energy spread measurement)

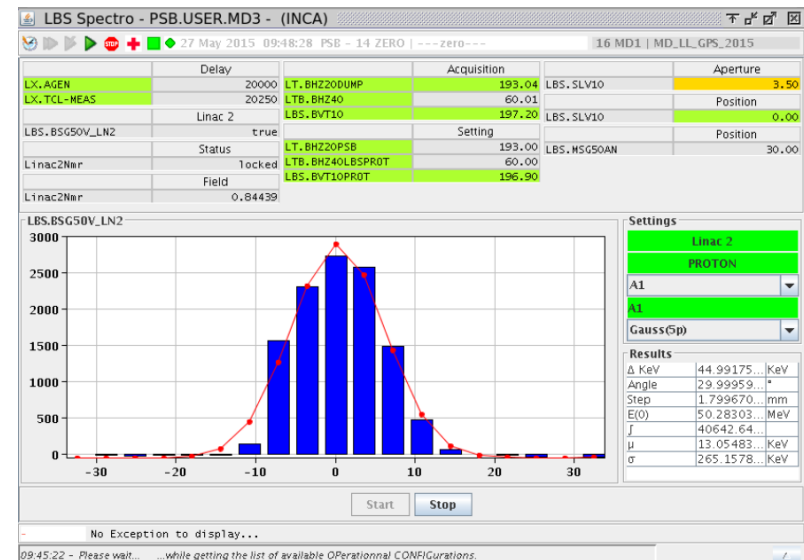
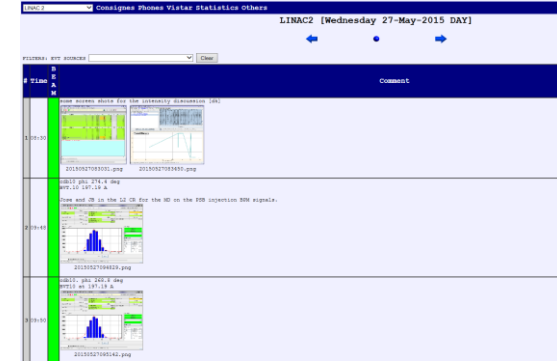
Energy spread is increasing when changing the operational phase

274.4° - We are at the bunching phase.

Energy spread (consequently the bunch length downstream

BI.QN60) can be reduced by almost a factor of 1.5 when lowering

the beam current to 70 mA.



From the L2 side

We confirmed that the operational buncher phase is the bunching phase (274.4°).
Going out of this phase increases the bunch length and the risk of consecutive 200 MHz bunch « visible » overlap.

Simulations show an expected bunch length of +/- 180° (would consider it is more).

For what concerns a possible evolution along the beam pulse we should have a look at the RF stability in all accelerating structures (beam loading shape from RFQ to CDB.10).

Done for CDB10 and the beam loading is very small and stable:

A clue telling us that RF looks OK.

Thanks to Giulia for deputize the talk