Study of TMCI in the LHC

Follow-up for LHC at injection, without damper

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Single bunch, no damper
Growth rate vs $Q'$
Single bunch, no damper, Q'\#=0

TMCI threshold at $\sim 8 \cdot 10^{11}$
Mode 0 and 1 decouple at $\sim 11 \cdot 10^{11}$
Mode -1 unstable at $\sim 12.5 \cdot 10^{11}$
Mode -1 and 2 couple at $\sim 18 \cdot 10^{11}$
Single bunch, no damper, $Q'=0$

Mode -13 is the most unstable according to DELPHI

Need to check DELPHI's convergence criterion on the mode complex frequency shift
Single bunch, no damper, $Q'=-1$

Negative chromaticity: mode 0 unstable
TMCI still visible
Single bunch, no damper, $Q'=-3$

Negative chromaticity: mode 0 unstable

TMCI not visible anymore
Conclusion and next steps

- At injection for $Q' = 0$, TMCI threshold at $\sim 8 \cdot 10^{11}$, decoupling at $\sim 11 \cdot 10^{11}$

- For $Q' = 0$, DELPHI's behavior in the TMCI region needs to be investigated

- Further studies with tighter collimators settings in IP3 and IP7 to lower the TMCI threshold at injection