LHC stability predictions with DELPHI

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Outline

1. Stabilizing octupole current at 450 GeV
2. Stabilizing octupole current at 6.5 TeV
3. DELPHI vs NHTVS at 6.5 TeV
We consider $\sigma_z = 9.7 \, \text{cm}$, $N_b = 10^{11} \, \text{ppb}$, $\varepsilon_n = 2 \, \mu\text{m}$.

One bunch case with damper at 50 turns (gain=0.02).

The stabilizing octupole current is calculated for parabolic (cut at $6\sigma$) and gaussian distribution for $I_{\text{oct}}$ positive or negative (positive now in the LHC).

N.B.: No space charge is considered.
We consider $\sigma_z = 9.7 \text{ cm}$, $N_b = 10^{11}$ ppb, $\varepsilon_n = 2 \mu\text{m}$.

One bunch case without damper.

The stabilizing octupole current is calculated for parabolic (cut at $6\sigma$) and gaussian distribution for $I_{oct}$ positive or negative (positive now in the LHC).

N.B.: No space charge is considered.
- We consider $\sigma_z = 9.7 \text{ cm}$, $N_b = 10^{11} \text{ ppb}$, $\varepsilon_n = 2 \mu m$.
- 2748 bunch case with damper at 50 turns (gain 0.02).
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N.B.: No space charge is considered.
We consider $\sigma_z = 7.5 \text{ cm}$, $N_b = 10^{11}$ ppb, $\varepsilon_n = 2 \mu m$.

- **One bunch** case with damper at 50 turns (gain=0.02).

- The stabilizing octupole current is calculated for parabolic (cut at $6\sigma$) and gaussian distribution for $I_{oct}$ positive or negative (positive now in the LHC).

![Graphs showing stabilizing octupole current for parabolic and gaussian distributions](image)
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• 2748 bunches case without damper.

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SD d0 plane x M2748 parabolic eps2um Nb1e11

SD d0 plane x M2748 gaussian eps2um Nb1e11
• We consider $\sigma_z = 7.5 \text{ cm}$, $N_b = 1.3 \cdot 10^{11}$ ppb, $\varepsilon_n = 1.5 \mu\text{m}$.
• One bunch case with damper 50 turns (gain=0.02).
• The stabilizing octupole current is calculated for gaussian distribution for $I_{oct}$ positive.
• We consider $\sigma_z = 7.5 \, cm$, $N_b = 1.3 \cdot 10^{11} \, ppb$, $\epsilon_n = 1.5 \, \mu m$.

• One bunch case without damper.

• The stabilizing octupole current is calculated for gaussian distribution for $I_{oct}$ positive.

SD d0 plane x M1 gaussian eps1.5um Nb1.3e11

\[ g=0 \]
We consider $\sigma_z = 7.5 \, \text{cm}$, $N_b = 1.3 \cdot 10^{11} \, \text{ppb}$, $\varepsilon_n = 1.5 \, \mu\text{m}$.

- **One bunch case with damper** 50 turns (gain=0.02).
- The stabilizing octupole current is calculated for gaussian distribution for $I_{\text{oct}}$ positive.