

Ecloud in SPS feedback

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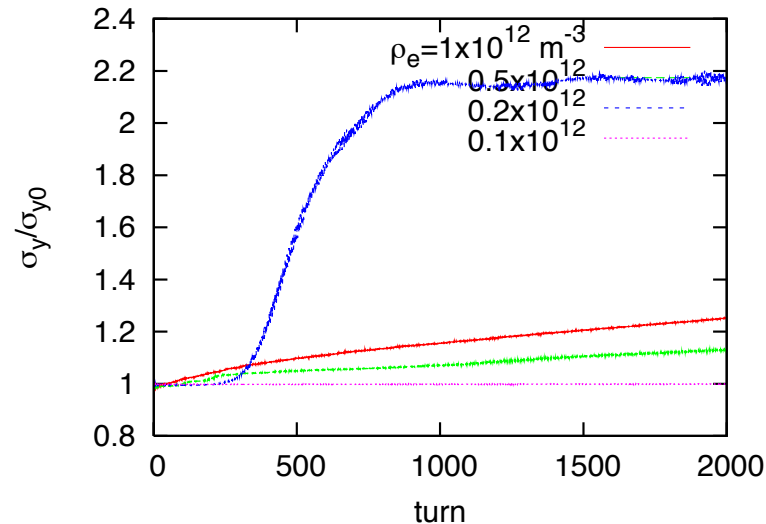
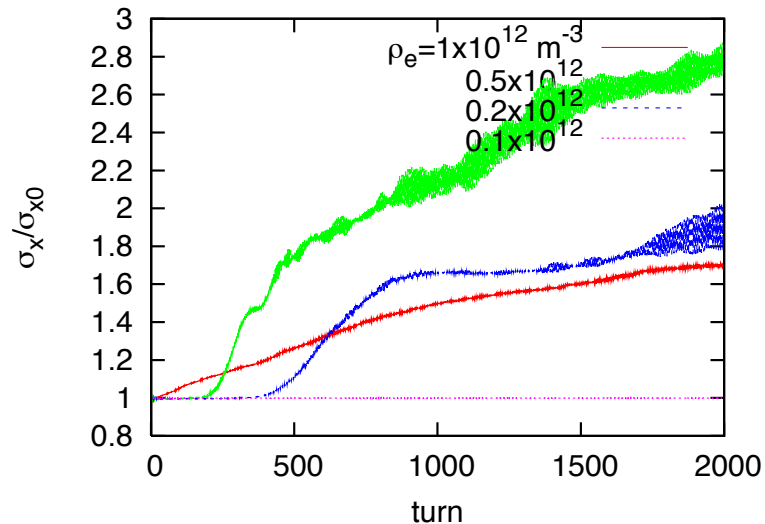
Parameter

- $E=26 \text{ GeV}$, $\varepsilon=1.01 \times 10^{-7}$, $\beta_x=33.85\text{m}$,
 $\beta_y=71.87\text{m}$
- $\sigma_z=0.229\text{m}$, $\sigma_E=0.19\%$, $\alpha=1.92 \times 10^{-3}$,
 $v_s=0.00564$
- $\omega_e/2\pi=355 \text{ MHz}$, $\omega_e\sigma_z/c=1.7$
- $\rho_{e,\text{th}}=1.4 \times 10^{11} \text{ m}^{-3}$.(use the formula)

$$\rho_{\text{th}} = \frac{2 \gamma v_s \omega_e q_p / c}{\sqrt{3} K Q r_e \beta_y L};$$

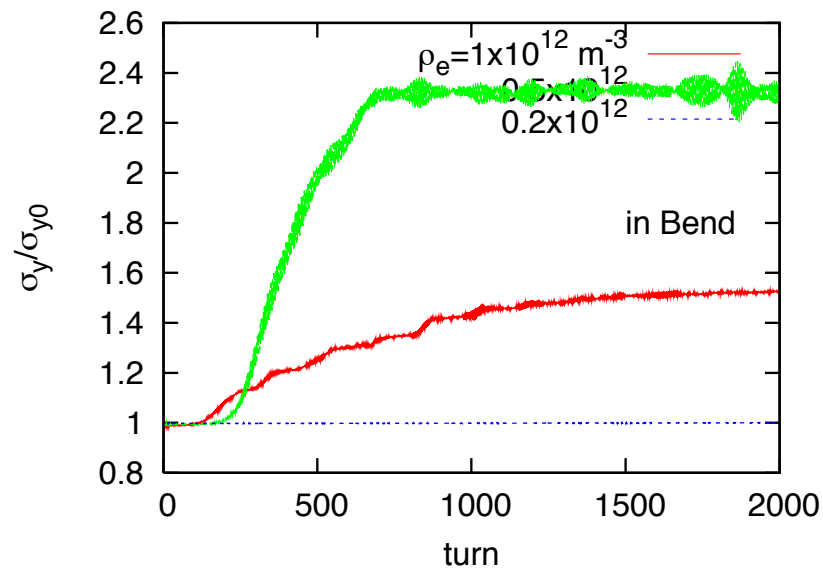
Electron cloud in Free space

- Note $\sigma_x < \sigma_y$



- Instability signal is clear near the threshold
- Incoherent (artifact) effect is strong in high density.

Electron cloud in bending magnet



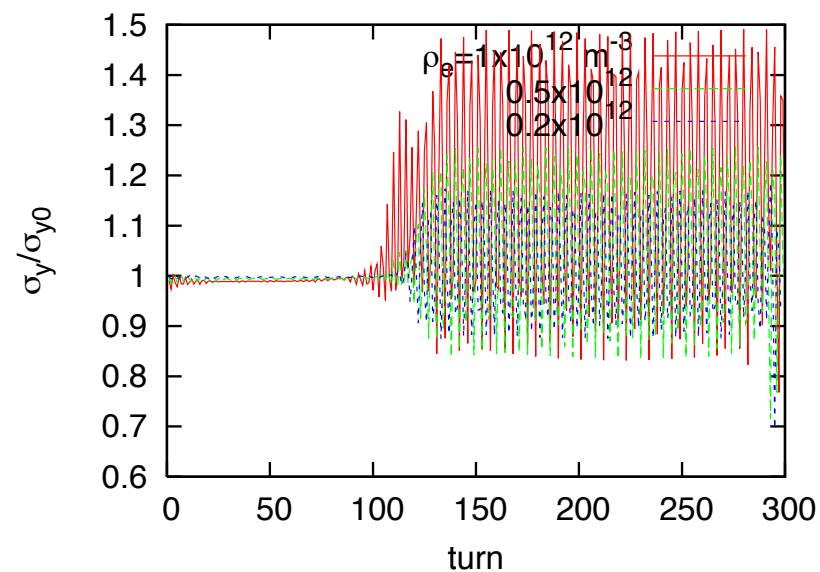
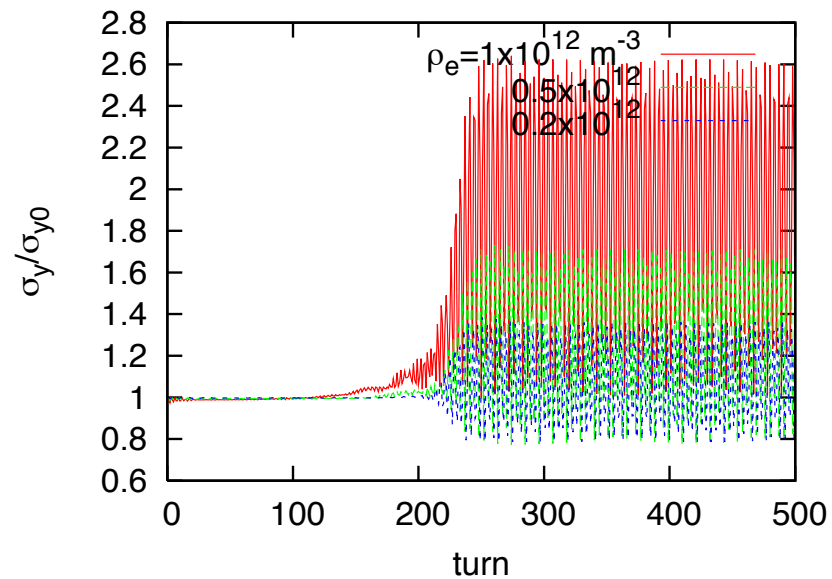
- No x instability

Feedback

- One turn delay, suppress only dipole motion

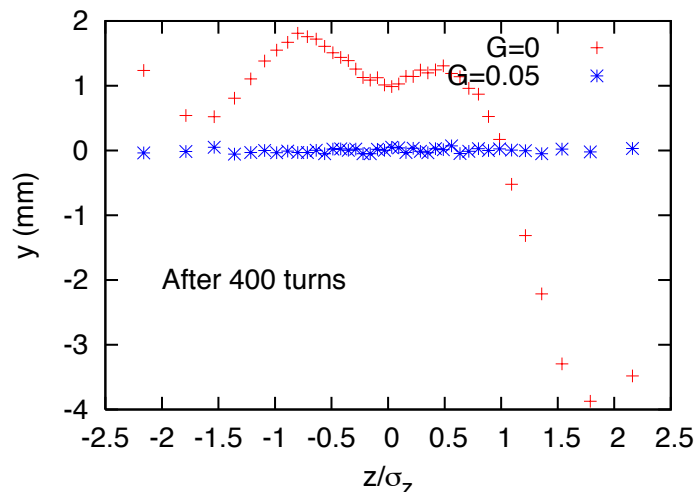
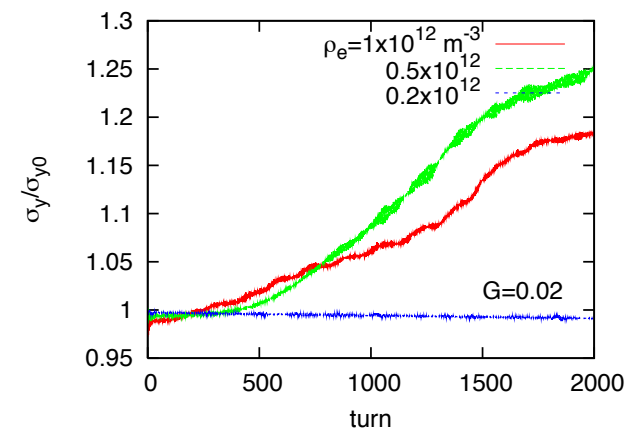
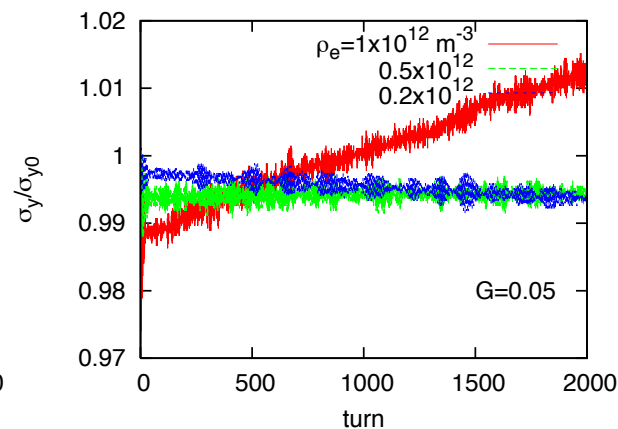
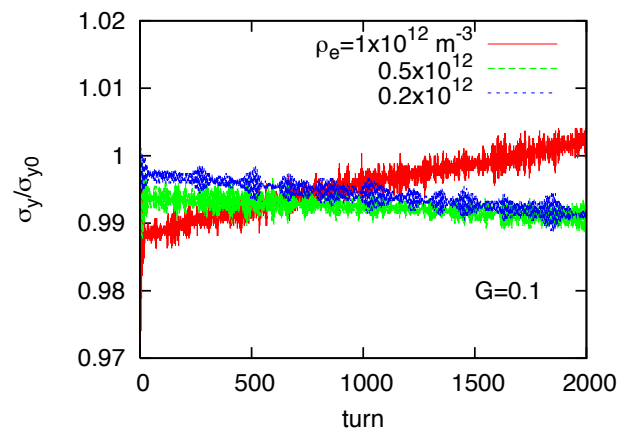
$G=0.05$

0.1



High frequency Feed back

- Feedback slice by slice, nonuniform 40 slices. Max $c/\Delta z=22$ GHz.



The feedback with <10 GHz should give the same result, since high frequency component is not contained.

Summary

- High frequency feedback suppress the head-tail instability induced by electron cloud.
- The gain is $G > 0.05$ (20 turn).
- Feedback with several GHz is examined.