

# Electron Cloud density

K.

$$\rho \propto \frac{N}{S_B} N_\gamma \propto \frac{N}{S_B} \gamma \cdot \kappa \propto \frac{N}{S_B} \gamma \text{ freq}$$

$N$ : number of  $e^+$ /bunch

$S_B$ : bunch spacing

$N_\gamma$ : number of photons/ $e^+$ /time

$\kappa$ : curvature

freq: revolution frequency

## KEKB LER

Simulation  $\rho_1 = 1.1 \times 10^{12} \text{ m}^{-3}$  [1]

$$N/S_B = 3.1 \times 10^{10} / 8 \text{ nsec}$$

Measurement  $\rho_2 = 7.8 \times 10^{11} \text{ m}^{-3}$  [2]

$$N/S_B = 1.25 \times 10^{10} / 8 \text{ nsec}$$

$$\frac{\rho_{ATF}}{\rho_1} \approx \frac{1 \times 10^{10} / 2.8}{3.1 \times 10^{10} / 8} \cdot \frac{1.3}{3.5} \cdot \frac{2.2 \times 10^6}{1 \times 10^5} \approx 7.5$$

$$\frac{\rho_{ATF}}{\rho_2} \approx \frac{1 \times 10^{10}}{1.25 \times 10^{10}} \dots \approx 19$$

$$\Rightarrow \rho_{ATF} = 8 \times 10^{12} \sim 1.5 \times 10^{13} \text{ m}^{-3}$$

Threshold of strong head-tail instability,

$$P_{th} = \frac{2 \gamma f_s}{r_e c \langle \beta_y \rangle} \quad [1] \quad \left( \times \frac{1}{\pi} \right) \quad [2]$$

ATF :  $f_s \approx 10 \text{ kHz}$ ,  $\langle \beta_y \rangle = 3.5 \text{ m}$

$$P_{th} \approx 1.8 \times 10^{13} \text{ m}^{-3} \quad (5.6 \times 10^{12}) \text{ ? ?}$$

KEKB LER :  $f_s \approx 1 \text{ kHz}$ ,  $\langle \beta_y \rangle = 10 \text{ m}$

$$P_{th} = 1.7 \times 10^{12} \text{ m}^{-3} \quad (5.3 \times 10^{11}) \text{ ? ?}$$

Ref. [1] K. Ohmi and F. Zimmermann.

KEK preprint 2000-19  
CERN-SL-2000-15(AP)

[2] Ieiri OHO'2000