



BEPCII : Major Upgrade of the Beijing Electron-Positron Collider



BEPCII Team

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The major upgrade of the Beijing Electron-Positron Collider (BEPCII) is one of China's key projects. It is a double ring e^+e^- collider as well as a synchrotron radiation (SR) source with its outer ring, or SR ring. Construction of BEPCII started in the beginning of 2004. Installation of the storage ring components completed in October 2007. The commissioning of BEPCII started in June 2008 together with BESIII detector. The luminosity increased step by step and reached 1/3 of design value in May 2009. The collider has been in routine operation since November 2009.

Beam energy range	1–2.1 GeV
Optimized beam energy	1.89GeV
Luminosity @ 1.89 GeV	$1 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$
Injection from linac	Full energy injection: $E_{inj}=1.55\text{--}1.89\text{GeV}$ Positron injection rate > 50 mA/min
Dedicated SR operation	250 mA @ 2.5 GeV

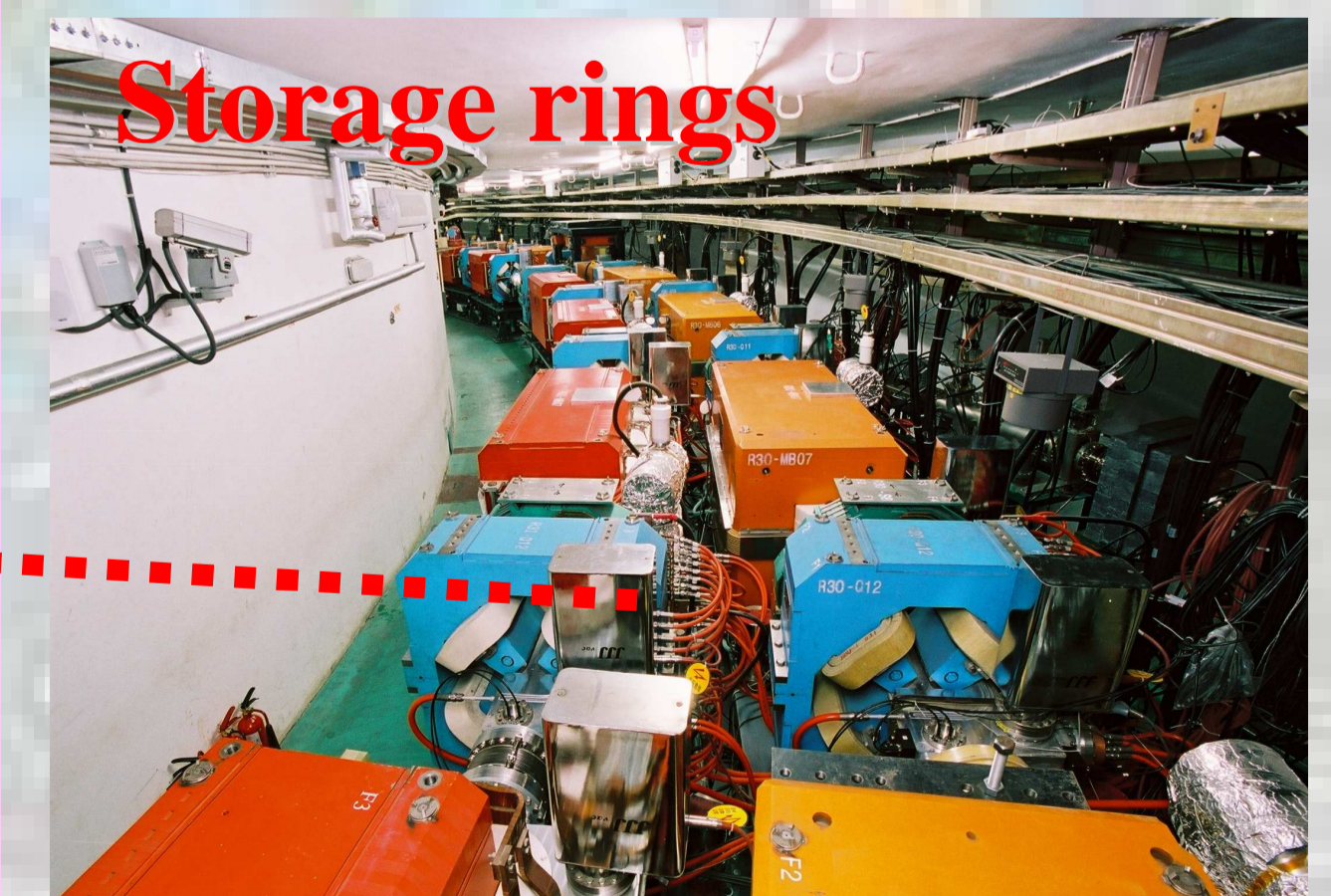
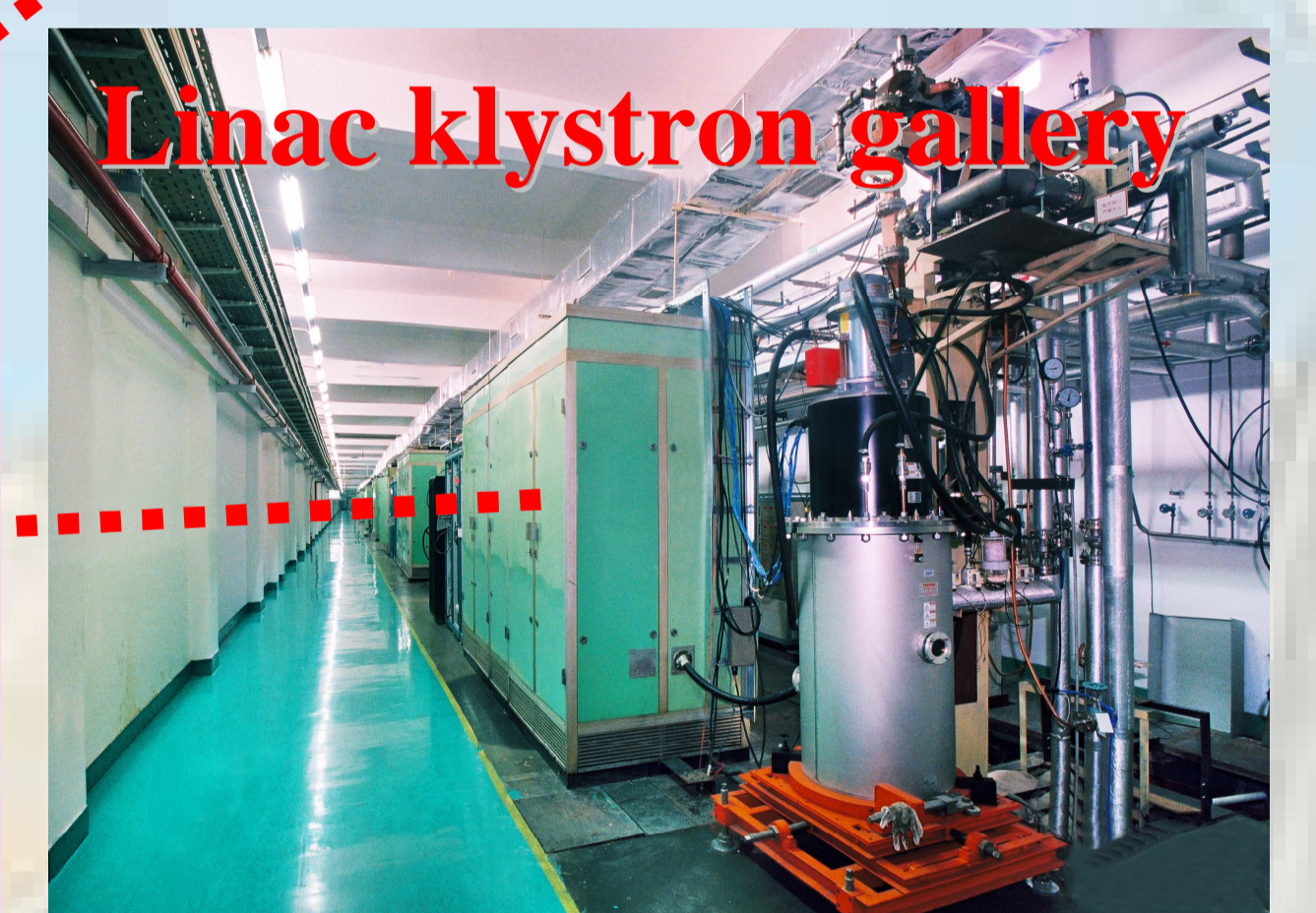
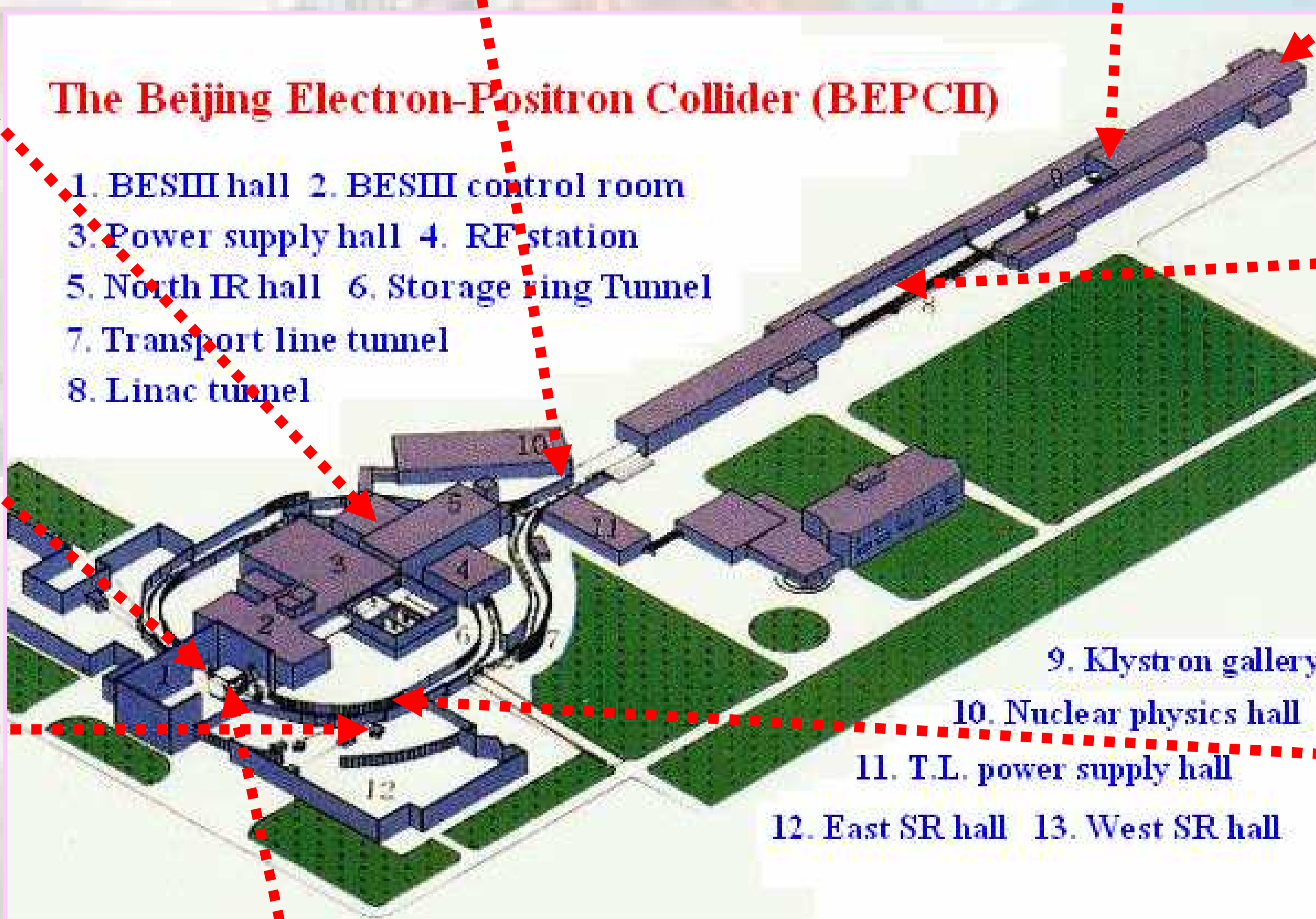
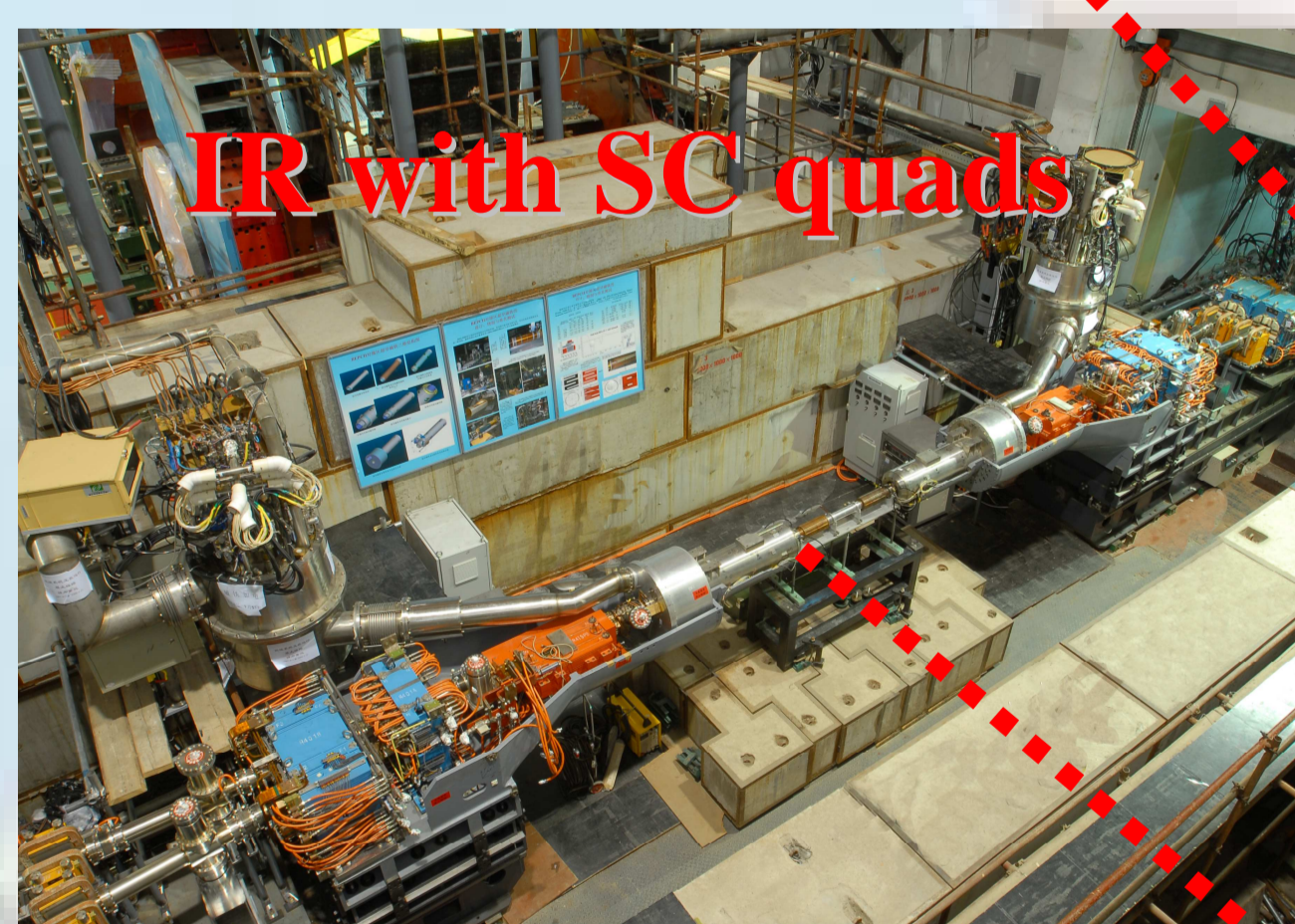
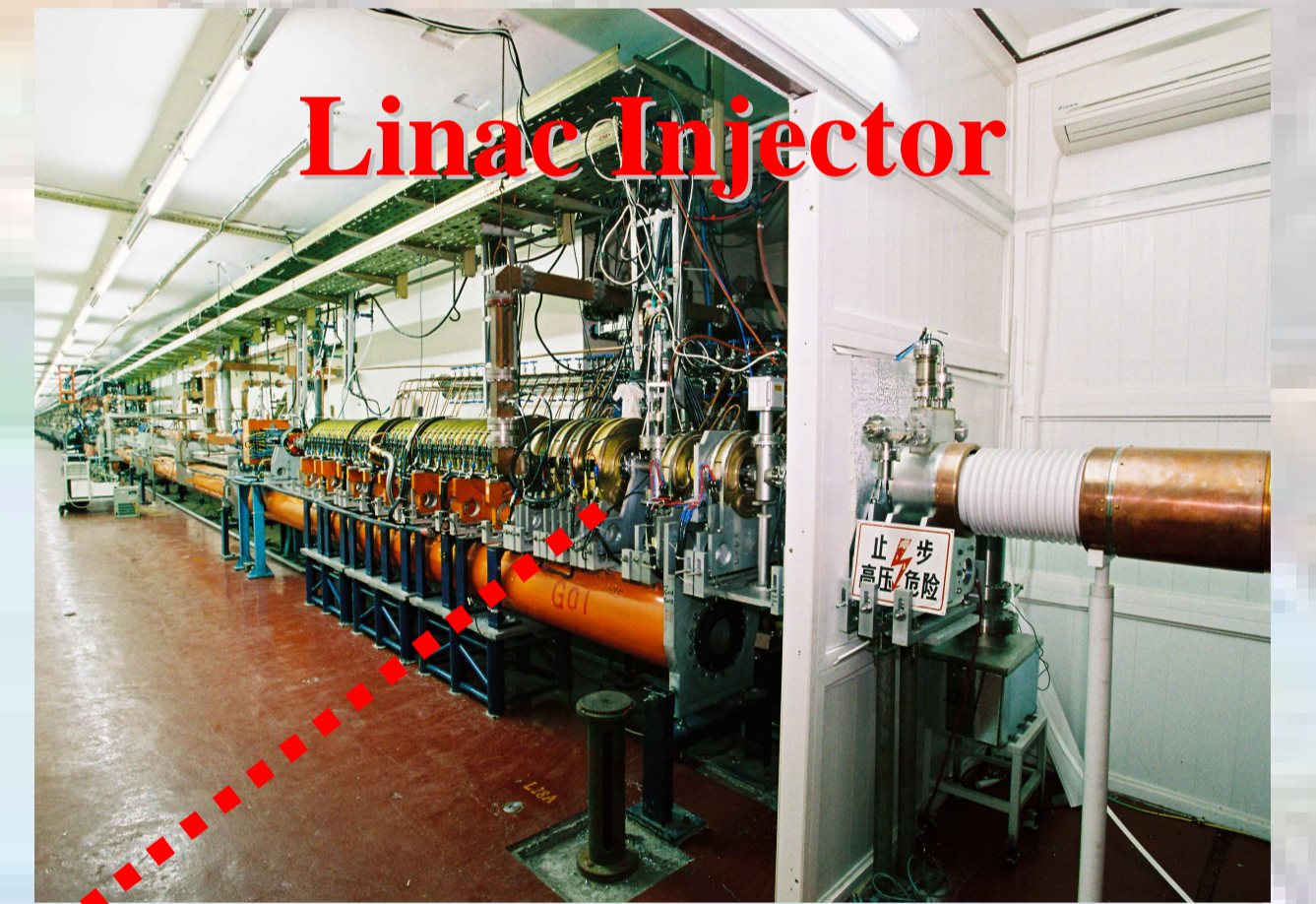
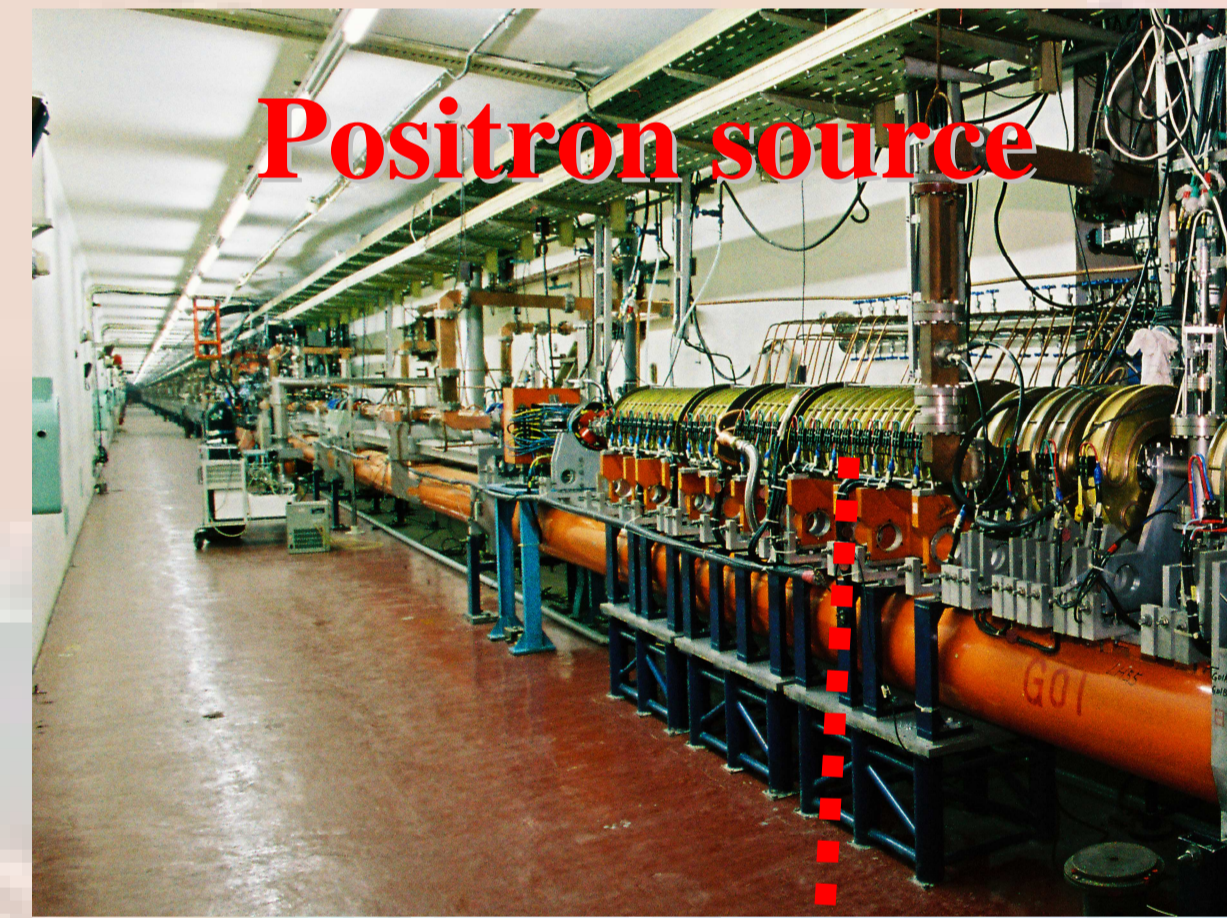
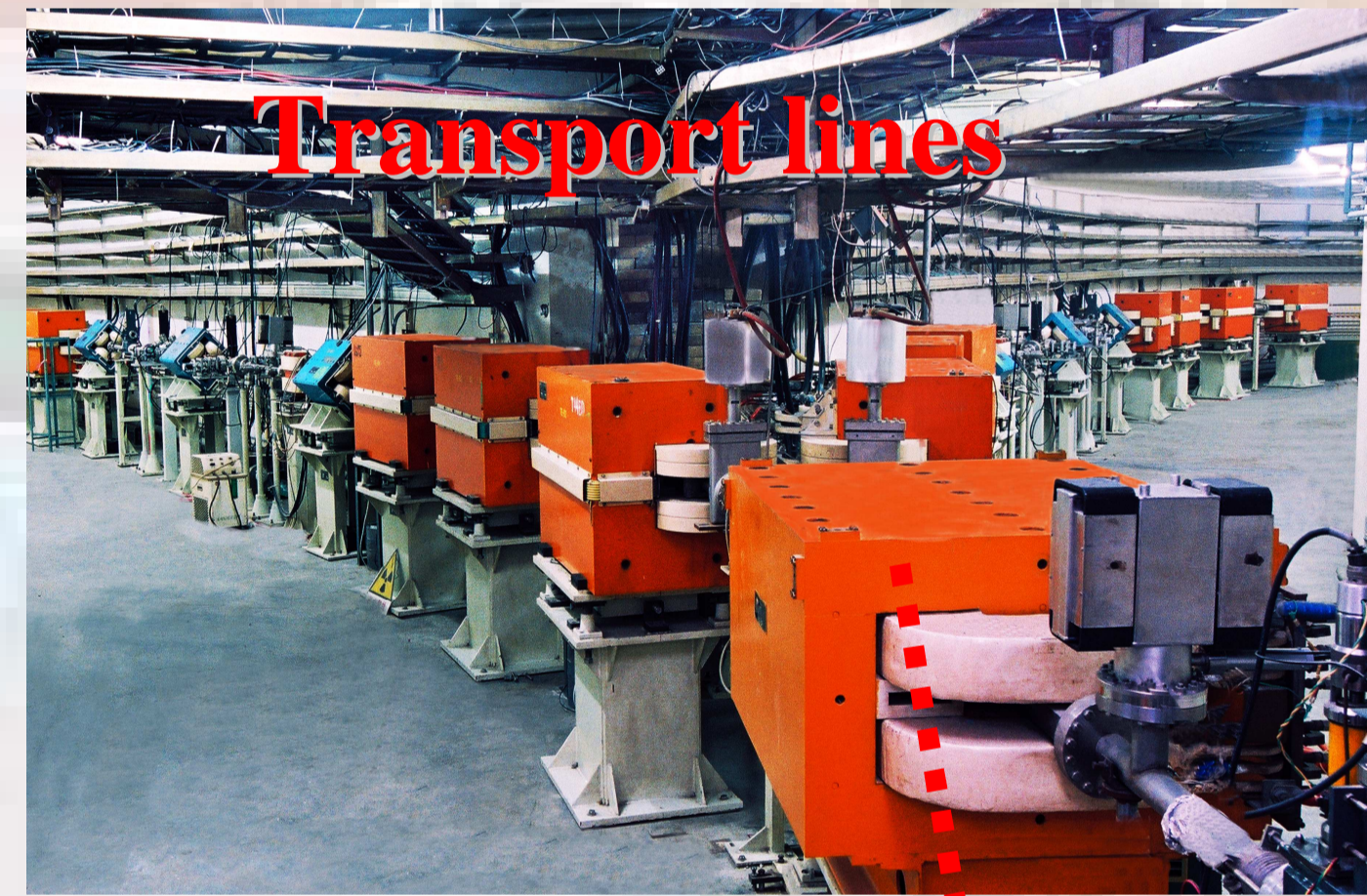
Strategy of luminosity upgrade

Double-ring: multi-bunch, $k_b=1 \rightarrow 93$ Choose large ϵ_x & optimum param.: $I_b=9.75\text{mA}$, $\xi_y=0.04$

$$L(\text{cm}^{-2}\text{s}^{-1}) = 2.17 \times 10^{34} (1+R) \xi_y \frac{E(\text{GeV}) k_b I_b (A)}{\beta_y^* (\text{cm})}$$

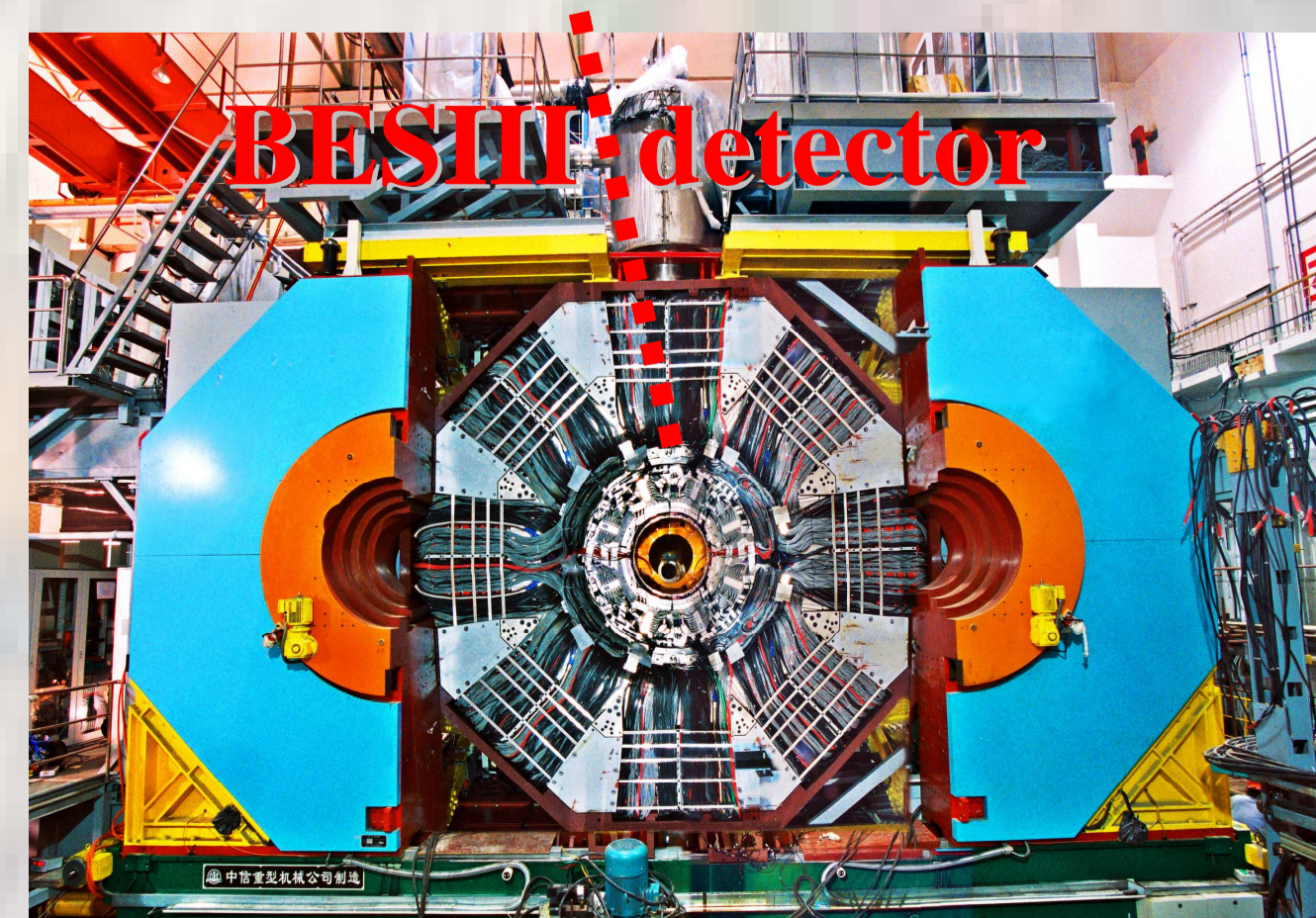
Micro- β : $\beta_y^* = 5\text{cm} \rightarrow 1.5 \text{ cm}$ Reduce impedance +SC RF
SC insertion quads $\sigma_r = 5\text{cm} \rightarrow <1.5\text{cm}$

$(L_{\text{BEPCII}}/L_{\text{BEPC}})_{\text{D.R.}} = (5.5/1.5) \times 93 \times 9.8/35 = 96$
 $L_{\text{BEPC}} = 1.0 \times 10^{31} \text{ cm}^{-2} \text{ s}^{-1} \rightarrow L_{\text{BEPCII}} = 1 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$



Synchrotron Radiation Operation

2.5 GeV, 250 mA, 10hrs, ~300 users



High Energy Physics Operation

Main parameters of the calibrated BESIII detector
 1.84 GeV, 2.550 mA, $\epsilon_x \approx 10^6 \text{ cm}^2$, 100M wGSD

Some physics signals