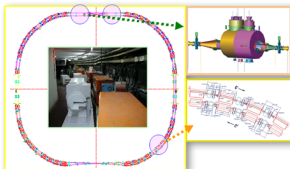




BEPCII: The Major Upgrade Program of BEPC

The major upgrade of BEPC, so called BEPCII, is a double-ring collider in the existing BEPC tunnel with the design luminosity of $10^{31} \text{cm}^{-2} \text{s}^{-1}$ at the beam energy of 1.89 GeV, i.e. increasing the luminosity by two orders of magnitudes. Each ring can be filled with up to 93 bunches with the maximum beam current of 0.9 A. The beams collide at the south interaction point with a horizontal crossing angle of 11 mrad. Superconducting micro-beta quads and Superconducting RF system will reduce the beam length. The upgrade of the linac injector allows full energy injection up to 1.89 GeV and a positron injection rate of 50 mA per minute. In upgrading the BES, a series of advanced technologies will be adopted to adapt to high event rate of BEPCII and the small bunch spacing, and greatly improve the measurement precision and particle identification ability as well as the solid angle acceptance of the detector.

The physics goal is the precision measurements and search for new physics in the τ -charm energy region. The total estimated budget for the BEPCII will be around 650 million Chinese Yuan (about 77m US\$). The Chinese Government approved the project 10 Feb. 2003. The design of the machine and the detector are finished. The construction is under way. The upgrade is expected to be finished by the end of 2006, and start the physics running.



the layout of the BEPCII double-ring structure

Magnet: -1 T Super conducting

MDC: small cell & He gas
 $\sigma_x = 130 \mu\text{m}$
 $\sigma_{xp} = 0.5\%$ @1GeV
 $dE/dx = 6\%$

TOP:
 $\sigma_x = 80 \mu\text{m}$ Barrel
 $100 \mu\text{m}$ Endcap

EMCAL: CsI crystal
 $\sigma_x/E = 2.5\%$ @1GeV
 $\sigma_x = 0.5 \text{cm}^2/E$

MuonID: 9 layer RPC

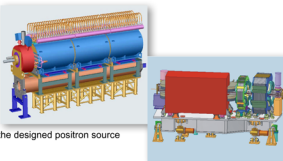
Trigger: Tracks & Showers
 Pipelined; Latency = 2.4 μs

Data Acquisition:
 Event rate = 3KHz
 Thrust = 50 MB/s

- adapt to high event rate of BEPCII: $10^{31} \text{cm}^{-2} \text{s}^{-1}$ and bunch spacing 8ns
- reduce sys. errors, to match high statistics photon measurement, PID...

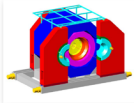
Main parameters of the BEPCII

Parameters	Unit	BEPCII
Operation energy (E)	GeV	1.0-2.1
Injection energy (E_{inj})	GeV	1.55-1.89
Circumference (C)	m	237.5
Revolution frequency (f_r)	MHz	1.247
Lattice type		FODO + micro-Insertions
β^* -function at IP (β_x^*/β_y^*)	cm	100/1.5
Tunes ($\nu_x/\nu_y/\nu_z$)		6.53/7.58/0.034
Natural energy spread (σ_x)		$2.73E \times 10^{-4}$
Mom. compaction factor (α_p)		0.0235
Emittance (ϵ_x/ϵ_y)	nm-rad	144/2.2 @1.89 GeV
Natural chromaticity (ξ_x^*/ξ_y^*)		-12.5/-25.5
Damping time ($\tau_x/\tau_y/\tau_z$)		25/25/12.5 @1.89 GeV
RF frequency (f_{rf})	MHz	499.8
Harmonic number (h)		396
RF voltage per ring (V_{rf})	MV	1.5
SR energy loss per turn (U_0)	keV	121 @1.89 GeV
Bunch number (n_b)		93
Bunch spacing s_b	m	2.4
Bunch current I_b	mA	9.8 @1.89 GeV
Beam current (I)	Colliding SR mA	9.10 @1.89 GeV 200 @2 GeV
Bunch length (cm) (σ_z)	cm	~1.5
Beam size at IP (σ_x^*/σ_y^*)	μm	380/5.7
Impedance ($ Z/n _0$)	Ω	~0.2
Crossing angle (ϕ_c)	mrad	± 11
Beam-beam parameter (ξ_x^*/ξ_y^*)		0.04/0.04
Beam lifetime (τ)	hrs.	~2.7
Luminosity @1.89 GeV \mathcal{L}	$10^{31} \text{cm}^{-2} \text{s}^{-1}$	1



the designed positron source

the magnet and vacuum part in stalled on rack in half cell 0 BEPCII arc region



the designed BESIII



a mechanical model of the end plate of the main draft chamber