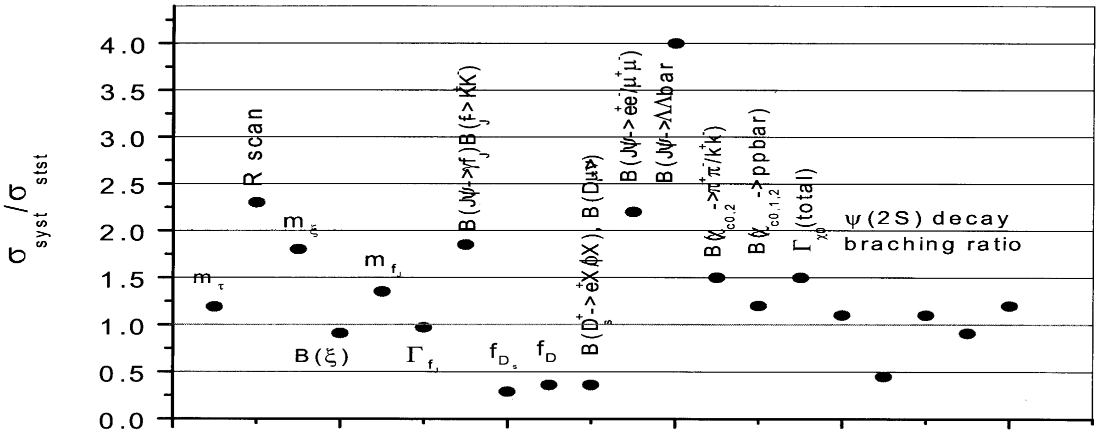
Data Collected with BESI and BESII

E_{cm} (GeV)	Physics	BES Data	Other Lab. Data
3.10	J/ψ	7.8×10^{6}	8.6×10^{6}
3.69	$\psi(2S)$	3.7×10^{6}	1.8×10^{6}
4.03	τ	1.0×10^{5}	LEP
4.03	D_S, D	22.3 pb^{-1}	CLEO
3.55 m_τ scan	m_τ	5 pb^{-1}	
2-5 R scan	R value, α_{QED}, $(g-2)_\mu$	6+85 points	$\gamma\gamma2$, MarkI Crystal Ball Pluto……
3.1	J/ψ	2.2×10^{7}	

Statistical and Systematic Uncertainties at BESI and BESII

$\sigma_{syst} > \sigma_{stat}$ for most of the measurements
$\rightarrow$ detector needs to be improved



What is BEPCII?

Machine

Original: $L \sim 10^{32}$ /(cm^{2}s) at E_{cm}=4.0 GeV
Now: $L_{BEPCII} = (5\sim10)\ L_{BEPC}$ at E_{cm}=???

Require

- Shorter bunch length (~5 cm↘ ~2 cm)
- Smaller energy spread (not much to gain)
- Lower background (will be worse than BEPC)

Measures

- Multi-bunch train (4~6 bunches, pretzel orbit)
- mini-β: ↘ impedance, ↗RF frequency &HV (200↗500 MHz); insert magnets close to collision point

What is BEPCII?

Detector

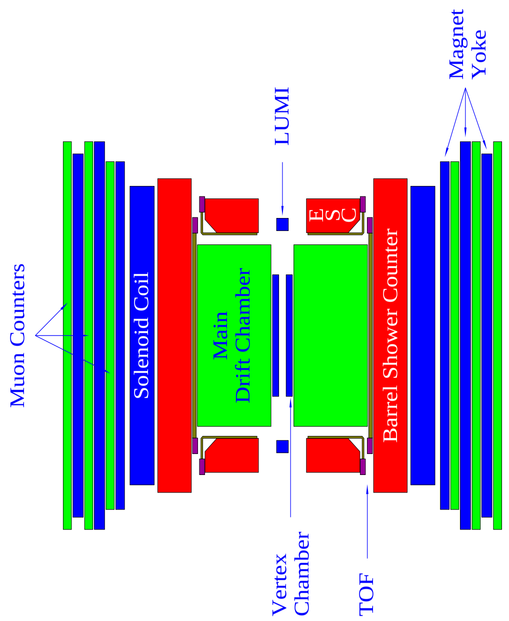
$$\sigma_{exp}^2 = \sigma_{stat}^2 + \sigma_{syst}^2$$

$L_{BEPCII} = (5\sim10)\ L_{BEPC}$, detector parameters needs a factor of 2-3 improvement.

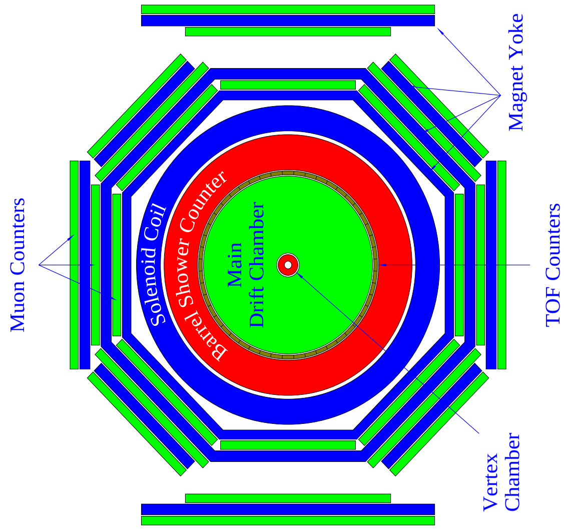
Two options:

1) A completely new generation detector (~200 M CNY)
   - My best favor
   - Unstable staffs are not interested in
   - Too expensive, and therefore unrealistic?

2) BESIII - significantly upgrade BESII (~150 M CYN)



Side view of the BES detector



End view of the BES detector

Principal Tasks for BESIII

- New barrel electromagnetic calorimeter (BEMC)
- Openable endcaps(door only in the first step)
- MDCIII (Al wires, or He gas?)
- New DAQ system adapting multi-bunch train
- All corresponding electronics
- New luminosity monitor (L.M.)
- New barrel time-of-flight (TOF)
- New vertex chamber (VC)
- New μ counter
- PC farm for data reconstruction and analysis
- Detector simulation based on GEANT3

$\longrightarrow$ Almost each subsystem has to be upgraded in the end!

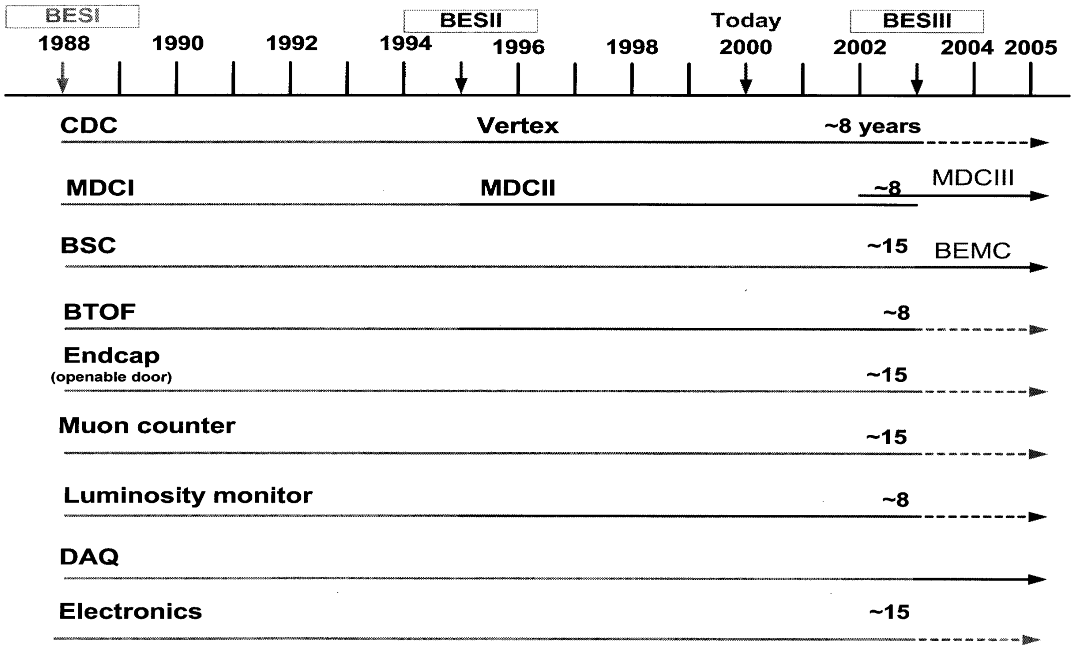
Major Detector Parameters

Detector	Major para.	BESI	BESII	BESIII
VC	$\sigma_{x,y}$ (μm)	200	100	BESII
MDC	σ_{xy} (μm) $\Delta p/p$ (%) $\sigma_{dE/dx}$ (%)	200-250 $1.76\sqrt{(1+p^2)}$ 7.9	190-220 $1.78\sqrt{(1+p^2)}$ 8.4	MDCIII (Al+He?) BESII
BTOF	σ_T (ps) L_{atten} (m)	375 1.0-1.2	180 3.5-5.5	~(120-150)
BSC	$\Delta E/\sqrt{E}$ (%) σ_z (cm) σ_ϕ(mrad)	23.8 4.5 7.9	22 4.5 7.9	<10 <4 <8
ETOF	σ_T (ps)		720	openable
ESC	$\Delta E/\sqrt{E}$ (%)	24.4	22.1	endcaps
μ counter	σ_z (cm)	5.5	5.5	Better coverage
DAQ	dead time (ms)	20	8	?

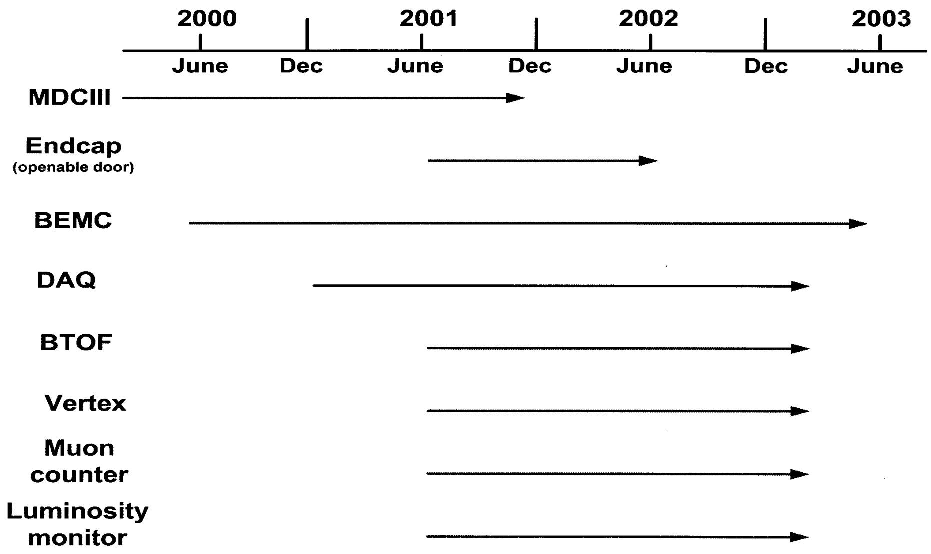
BESIII Type, Parameters and Cost Estimation

Item	Type	Parameter	Nominal value	Cost (M CNY)	Assumed by
MDCIII	Al wires, He gas MDCII cell structure	σ_{xy} (μm) $\Delta p/p$ (%) $\sigma_{dE/dx}$ (%)	~190-220 $1.78\sqrt{(1+p^2)}$ 7.8	10 (paid)	US+IHEP
BEMC	Scintillating fiber+P_b+glue (KLOE type)	$\Delta E/\sqrt{E}$ (%) σ_z (cm) σ_ϕ(mrad)	< 10 <4 <8	80	IHEP+?
End door	Openable			2	IHEP
DAQ	?	Dead time(ms)		3	IHEP+?
L.M.	?	$\Delta L/L$(%)	5	1.5	?
VC	Straw tube	$\sigma_{x,y}$ (μm)	100	2(?)	?
BTOF	Plastic sci. (96 pieces)	σ_T (ps)	120-150	10	?
μ counter	Increase coverage (?)	σ_z (cm)	5.5(?)	3(?)	?
Electronics				?	IHEP+

The Detector Age Issue



BESIII Construction Time Schedule



Physics Futures of the BEPC Energy Region

- Produce two of all three families of the quarks and all three lepton families
- Rich of resonances, charmonum and charmed mesons
- Threshold characteristics
- Transition between perturbative and non-perturbative QCD
- Gluenic matter and glueball

Physics Features in BEPC Energy Region

- Rich of resonances
- Thresholds characteristics
- Transition region between resonance and smooth perturbative