The BES Experiment at BEPC

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(Tsinghua University)

- Overview and a bit of history
- Selected results of BESI and BESII
- BEPC/BES upgrade and physics
- Status of BEPCII and BESIII

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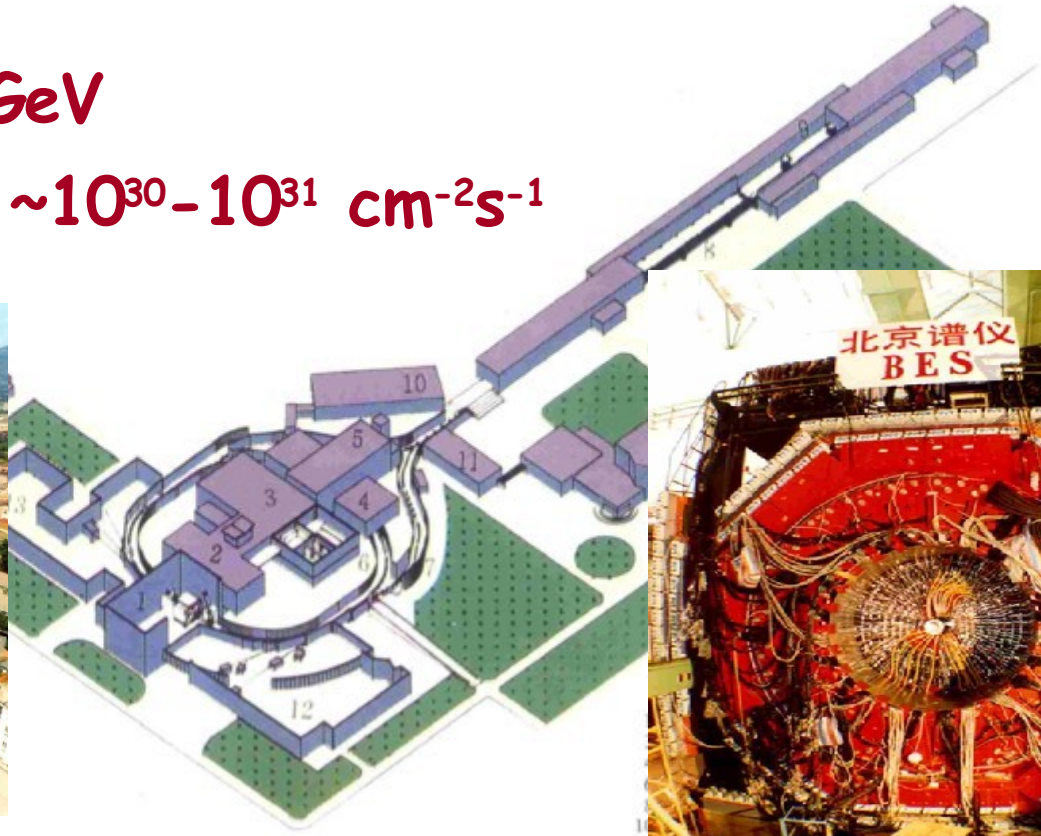
BEPC and BES

- Beijing Electron-Positron Collider (BEPC) and Beijing Spectrometer (BES) is the 1st large facility for high energy physics ever built in China.
  - E_{cm} : 2-5 GeV
  - Luminosity: ~10^{30}-10^{31} $cm^{-2}s^{-1}$



A bit of history

- 1984 Construction start
- 1989 Physics with BESI
- 1991 **Synchrotron radiation facility (BSRF) in trial**
  Network link IHEP—SLAC
- 1993 CAS approved the 1st upgrade plan: higher luminosity for BEPC, BESI to BESII.
  64K BPS internet connection to the world. Email service for institutions and universities. Connected to WWW in 1994.
- 1998 Physics with BESII
- 2003 State council approved 2nd upgrade plan: BEPC to BEPCII, BESII to BESIII.
- 2004 BEPC shutdown & dismounting for BEPCII.

方毅同志听取李政道教授对
中国第一台高能加速器建设方案的意见

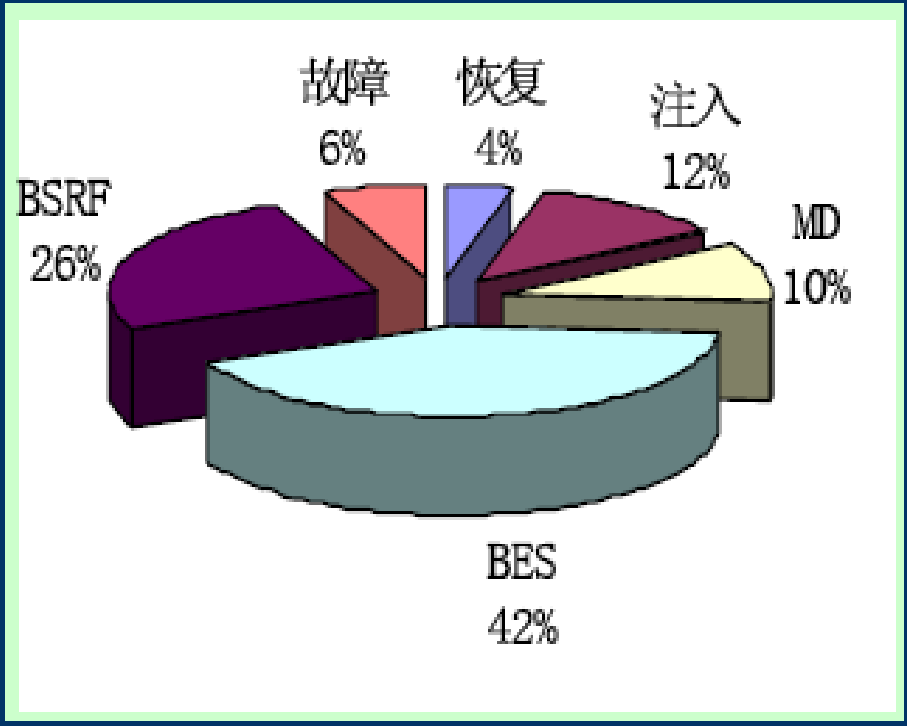
邓小平同志为北京正负电子对撞机工程奠基（1984.10）

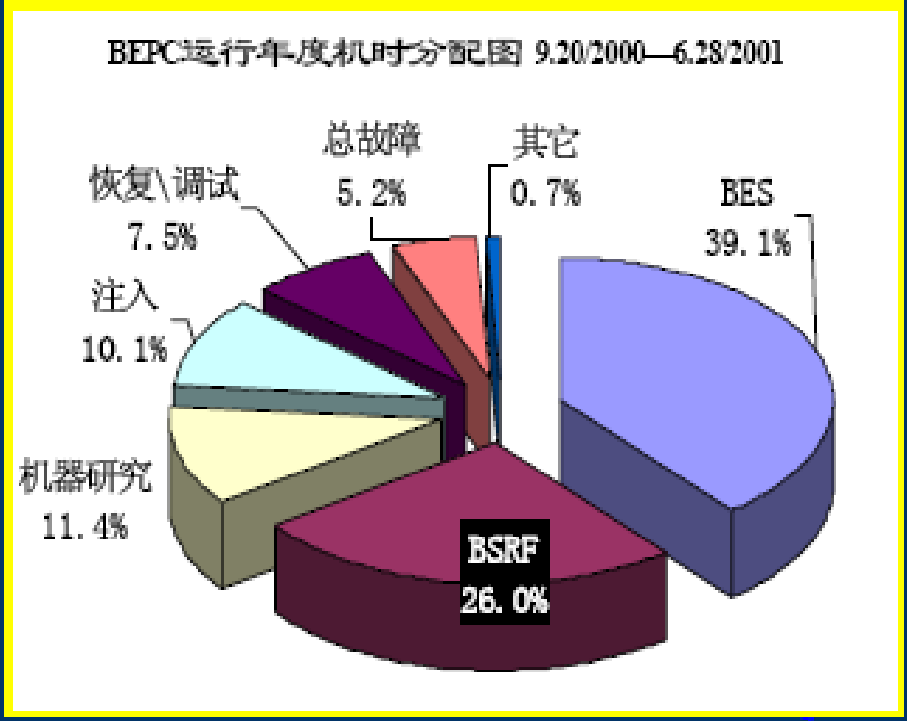
1989年10月6日，江泽民总书记视察北京正负电子对撞机。

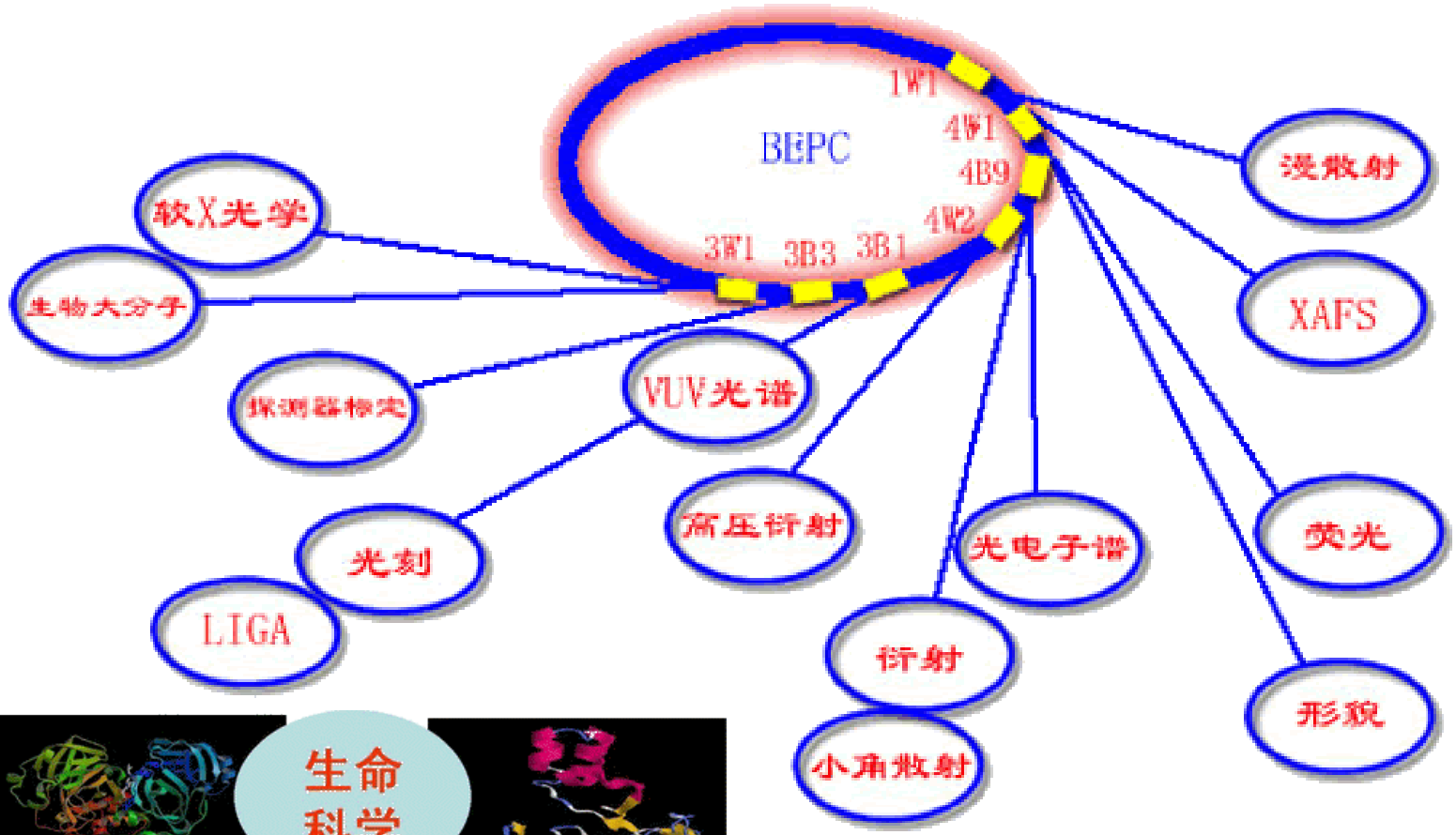
1994年9月16日，胡锦涛同志视察北京正负电子对撞机

年度机时分配

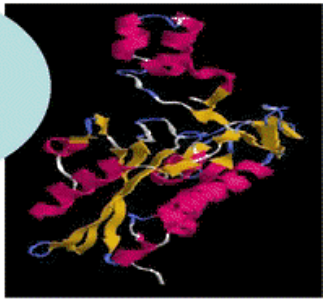
年度		运行	恢复	注入	调试	MD	BES	BSRF	其它	故障
00-01	计划	6648	266	798	-	694	2791	1700	0	399
	实际	6581	490.4	664.7	-	750.2	2574	1708	47.8	345.2





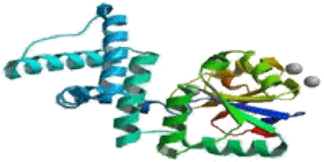


SARS主蛋白酶CoV M^{pro}



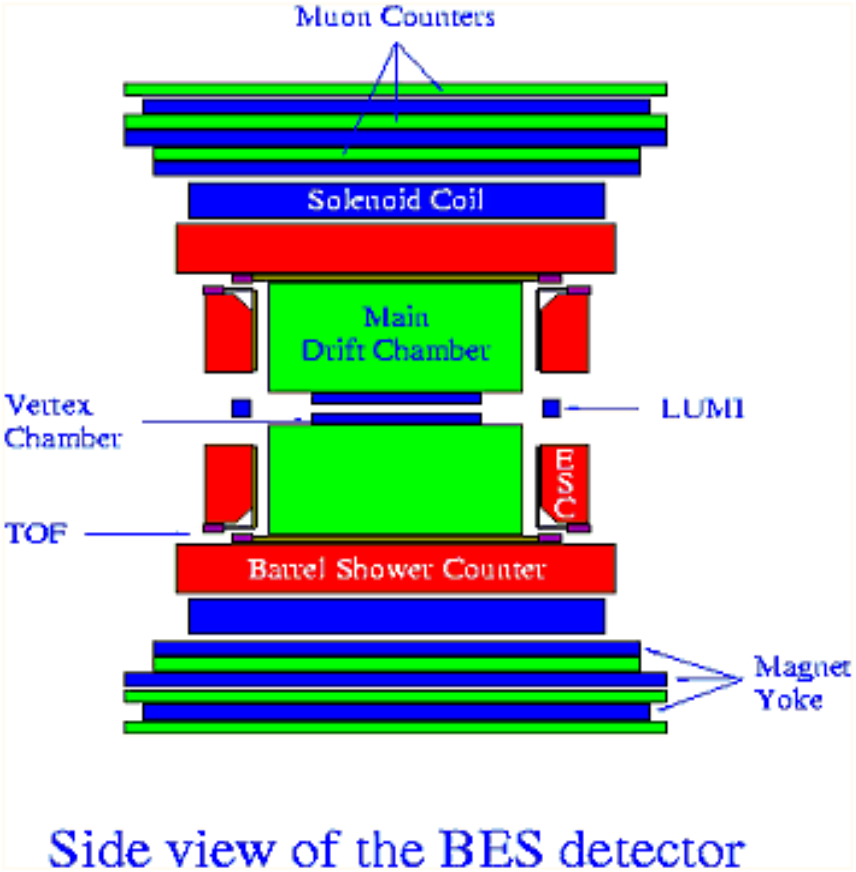
一种CRISP蛋白F3323的结构

（利用单对同晶置换+反常衍射得到结构）

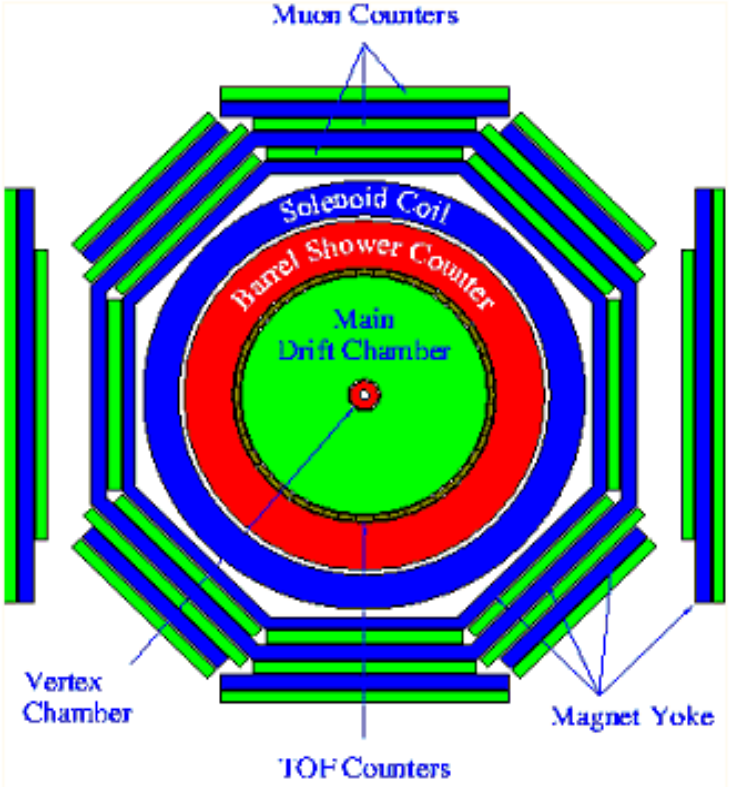


利用MAD方法解析的
甲基转移酶（MASA）的结构

BESII Detector (1995-1997 upgraded)



Side view of the BES detector



End view of the BES detector

VC: $\sigma_{xy} = 100\ \mu m$ TOF: $\sigma_T = 180$ ps μ counter: $\sigma_{r\phi} = 3$ cm

MDC: $\sigma_{xy} = 250\ \mu m$ BSC: $\Delta E/\sqrt{E} = 22\ \%$ $\sigma_z = 5.5$ cm

$\sigma_{dE/dx} = 8.4\ \%$ $\sigma_\phi = 7.9$ mr B field: 0.4 T

$\Delta p/p = 1.8\sqrt{(1+p^2)}$ $\sigma_z = 2.3$ cm Dead time/event: 10 ms

Institutions (ever) in BES Collaboration

Institute of High Energy Physics
California Institute of Technology
CCAST
Chonhuk University
Colorado State University
Gyeongsang National University
Henan Normal University
Huazhong Normal University
Hunan University
KEK
Korea University
Liaoning University
Miyazaki University
Nankai University
Nihon University
Queen Mary University of London
Peking University
Shandong University
Shanghai Jiaotong University
Sichuan University
SLAC
Seoul National University
University of Hawaii
University of California at Irvine
University of Science and Technology of China
University of Texas at Dallas
Tokyo Institute of Technology
University of Tokyo
Tsinghua University
Wuhan University
Zhejiang University

International Collaboration has played a curial role for BES

Highlights of BES Physics Results

- Precise measurement of the mass of tau lepton
- Precise measurement of R value in 2-5 GeV
- $\psi(2S)$ decays: Study many decay modes, the 12% rule
- J/ψ decays: Light hadron spectroscopy, search for
- multi-quark candidates, glueballs
- $\psi(3770)$ decays and D physics

- ~100 publications and more are coming
- Many results collected in PDG

Selected results from BES (1)

- τ mass measurement (1991)

PDG2007

τ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1776.90±0.20 OUR AVERAGE					
$1776.81^{+0.25}_{-0.23}\pm0.15$	81	ANASHIN	07	KEDR	$6.7pb^{-1}$, E^{ee} GeV
1775.1 ±1.6 ±1.0	13.3k	[1] ABBIENDI	00A	OPAL	LEP runs
1778.2 ±0.8 ±1.2		ANASTASSOV	97	CLEO	10.6 GeV
$1776.96^{+0.18}_{-0.21}{}^{+0.25}_{-0.17}$	65	[2] BAI	96	BES	E^{ee}_{cm} = 3.54–3.57 GeV
1776.3 ±2.4 ±1.4	11k	[3] ALBRECHT	92M	ARG	E^{ee}_{cm} = 9.4–10.6 GeV
$1783\ ^{+3}_{-4}$	692	[4] BACINO	78B	DLCO	E^{ee}_{cm} = 3.1–7.4 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1777.8 ±0.7 ±1.7	35k	[5] BALEST	93	CLEO	Repl. by ANASTASSOV 97
$1776.9\ ^{+0.4}_{-0.5}$ ±0.2	14	[6] BAI	92	BES	Repl. by BAI 96

[1] ABBIENDI 00A fit τ pseudomass spectrum in $\tau \to \pi^{\pm} \leq 2\pi^0\nu_\tau$ and $\tau \to \pi^{\pm}\pi^+\pi^- \leq 1\pi^0\nu_\tau$ decays. Result assumes m_{ν_τ}=0.

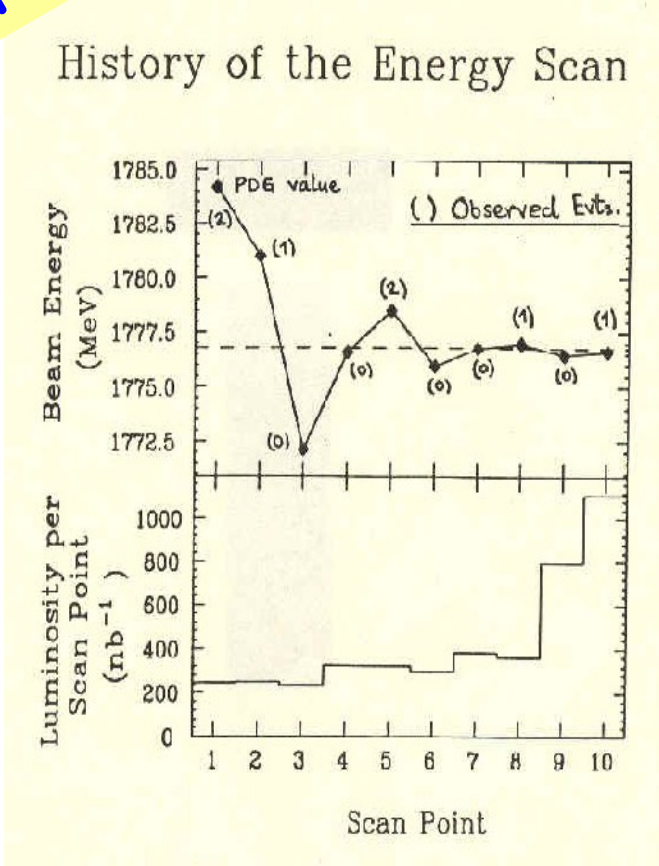
[2] BAI 96 fit $\sigma(e^+e^- \to \tau^+\tau^-)$ at different energies near threshold.

[3] ALBRECHT 92M fit τ pseudomass spectrum in $\tau^- \to 2\pi^-\pi^+\nu_\tau$ decays. Result assumes m_{ν_τ}=0.

[4] BACINO 78B value comes from $e^{\pm}X^{\mp}$ threshold. Published mass 1782 MeV increased by 1 MeV using the high precision $\psi(2S)$ mass measurement of ZHOLENTZ 80 to eliminate the absolute SPEAR energy calibration uncertainty.

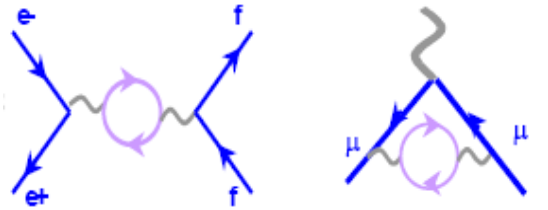
[5] BALEST

Lepton universality was re-confirmed!



Selected results from BES (2)

- R measurement (1998-1999)

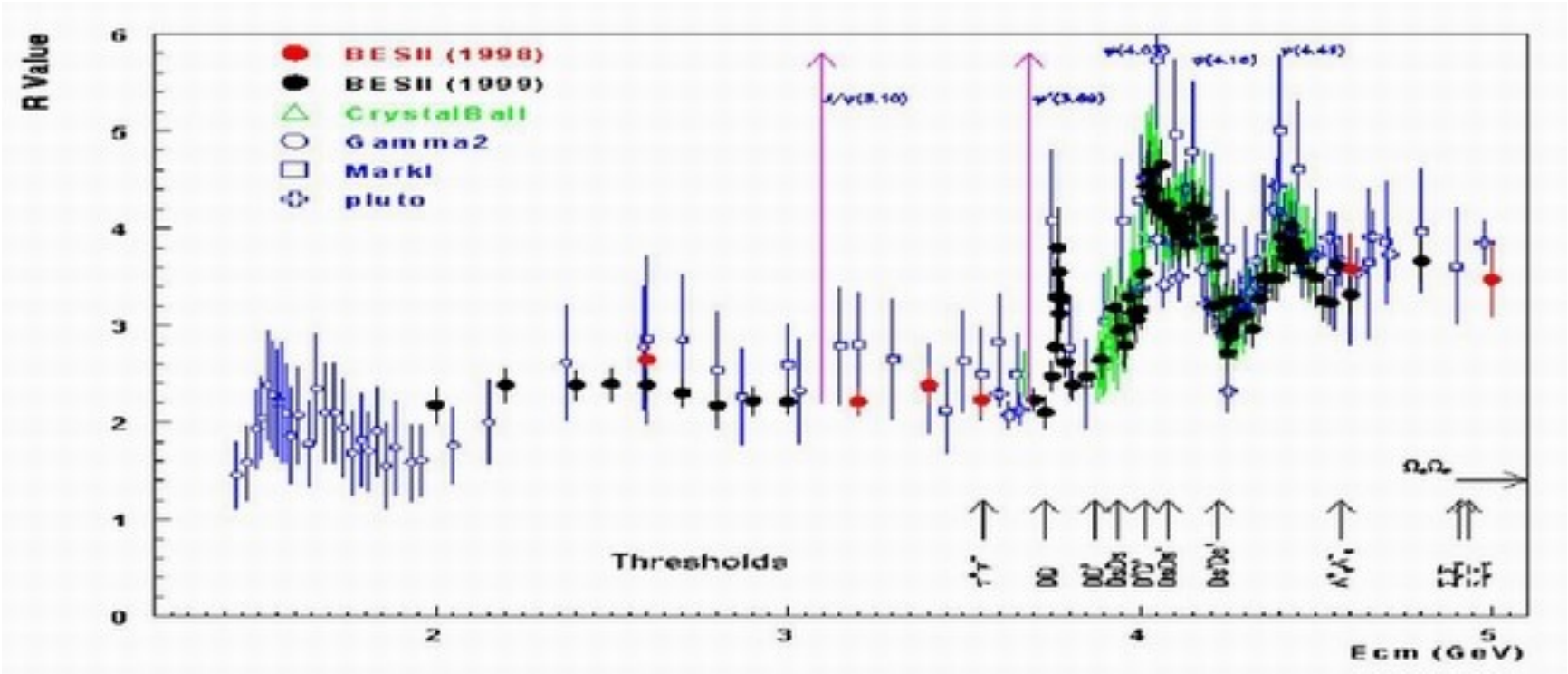


$\alpha(m^2_Z) = \alpha/(1-\Delta\alpha)$ $a_\mu \sim \alpha(Q^2)/2\pi$

$$\Delta\alpha_{lepton} = \sum_{l=e,\mu,\tau} \frac{\alpha}{3\pi}\left(\log\frac{m_Z^2}{m_l^2} - \frac{5}{3}\right) + \ldots$$

Optical Theorem

$$\Delta\alpha_{hadron} = -\frac{\alpha}{3\pi}\int_{4m_\pi^2}^{\infty} \frac{m_Z^2 ds'}{s'\left[s'-m_Z^2\right]} \frac{\sigma(e^+e^- \to \gamma^* \to q\bar{q})}{\sigma(e^+e^- \to \gamma^* \to \mu^+\mu^-)}$$



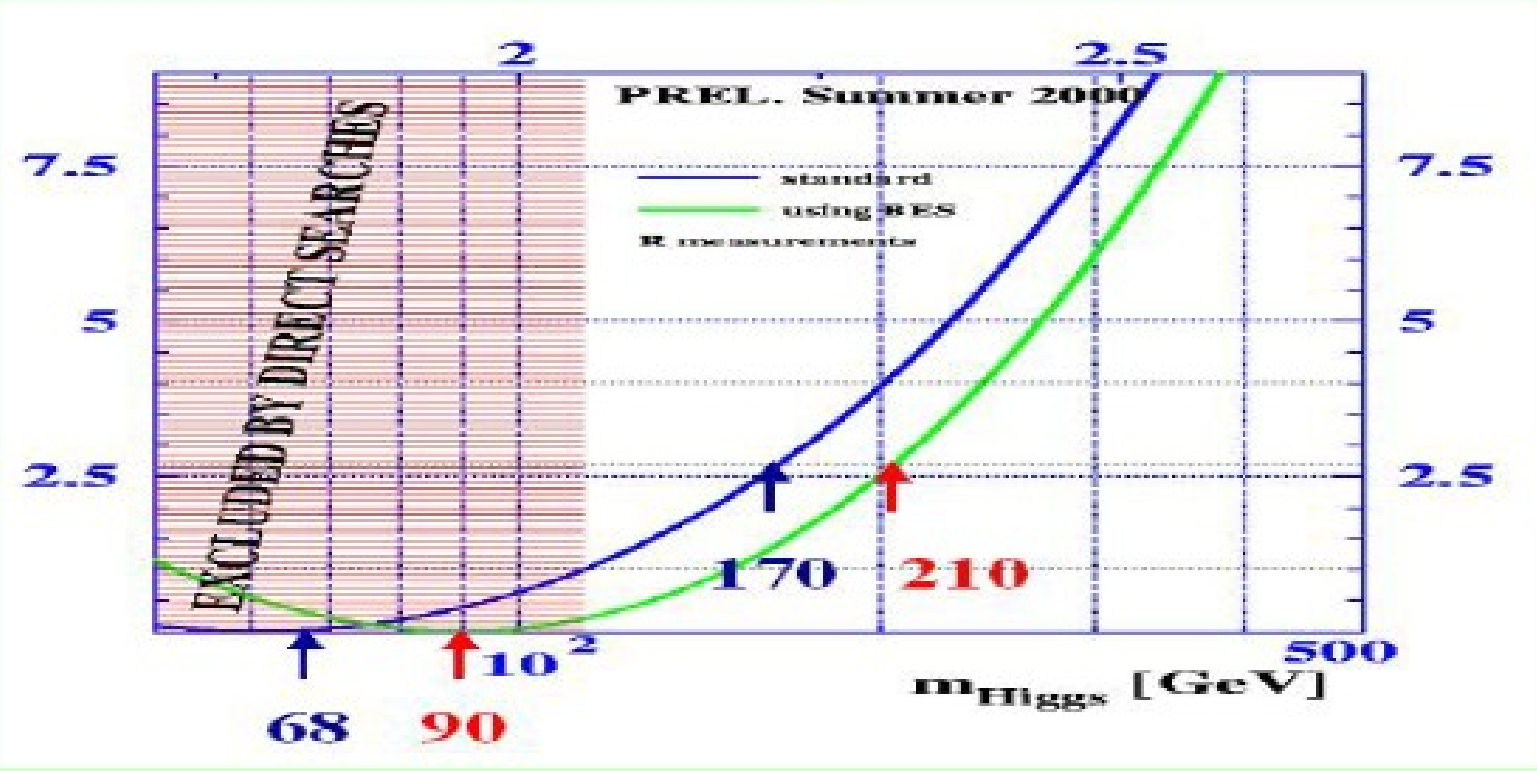
Impact of BES's New R Values on the SM Fit for $\alpha(M_z^2)$ and Higgs mass

1995 before BES R data

$$\alpha(M_Z^2)^{-1} = 128.890 \pm 0.090$$

2001 after BES R data

$$\alpha(M_Z^2)^{-1} = 128.936 \pm 0.046$$



Selected results from BES (3)

- Test the 12% rule

$$Q_h = \frac{B_{\psi' \to X}}{B_{J/\psi \to X}} = \frac{B_{\psi' \to e^+e^-}}{B_{J/\psi \to e^+e^-}} = 12\%$$

M. Appelquist and H. D. Politzer, PRL34, 43 (1975)

$$= (2/9\pi)(\pi^2 - 9)\tfrac{5}{18}\alpha_s{}^3(\tfrac{4}{3}\alpha_s)^3 m_{\psi'}. \qquad (3)$$

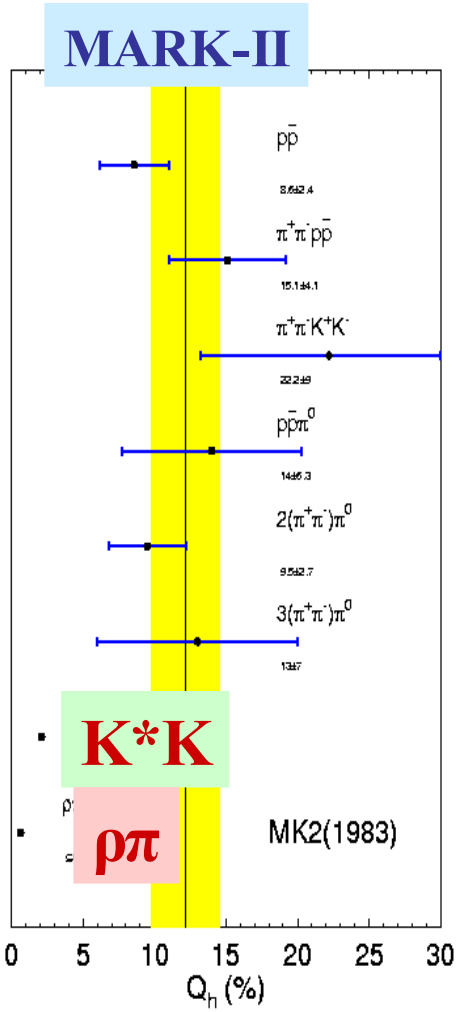
The leptonic width via one photon into $\bar{l}l$ is

$$\Gamma_l = |M_l|^2 |\Psi(0)|^2 = \tfrac{1}{2}(\tfrac{2}{3}\alpha)^2(\tfrac{4}{3}\alpha_s)^3 m_{\psi'}, \qquad (4)$$

where $\alpha \approx \frac{1}{137}$. Although separately these calculations are not trustworthy, the ratio

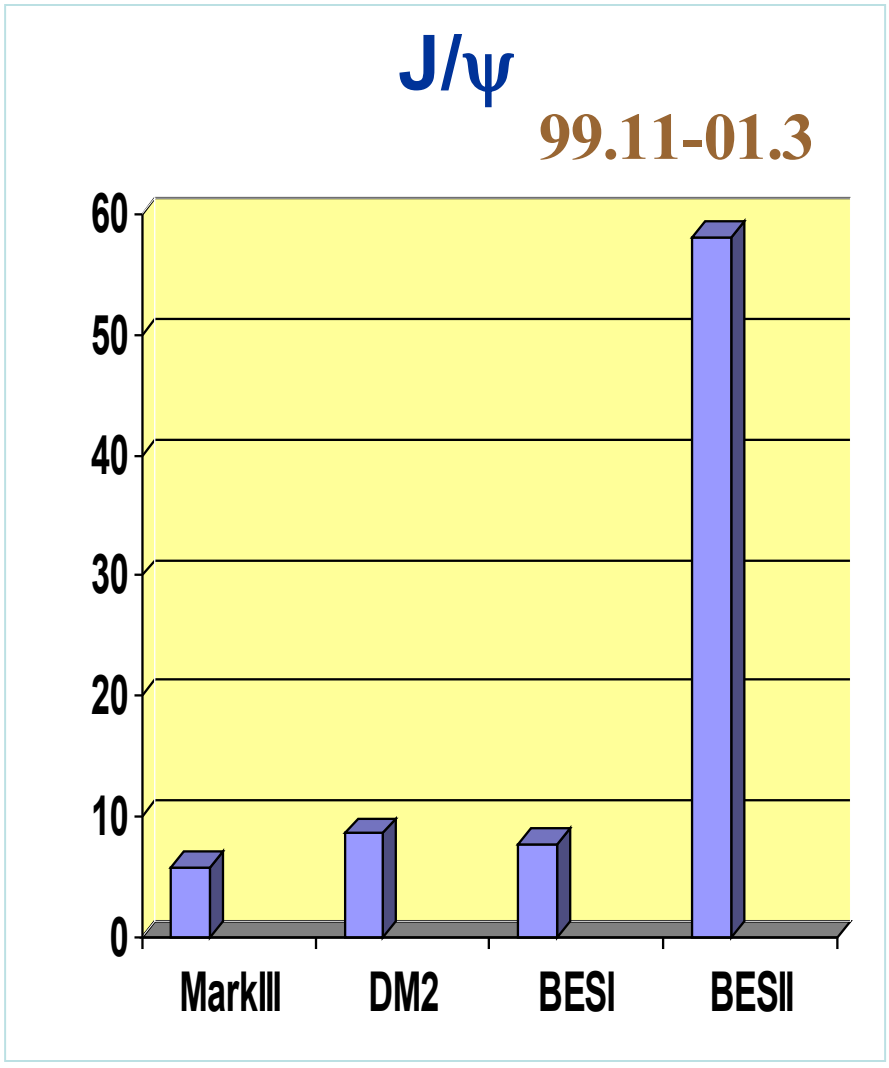
$$\frac{\Gamma_l}{\Gamma_h} = \frac{\frac{2}{9}\alpha^2}{(2/9\pi)(\pi^2 - 9)5/\alpha_s{}^3} \qquad (5)$$

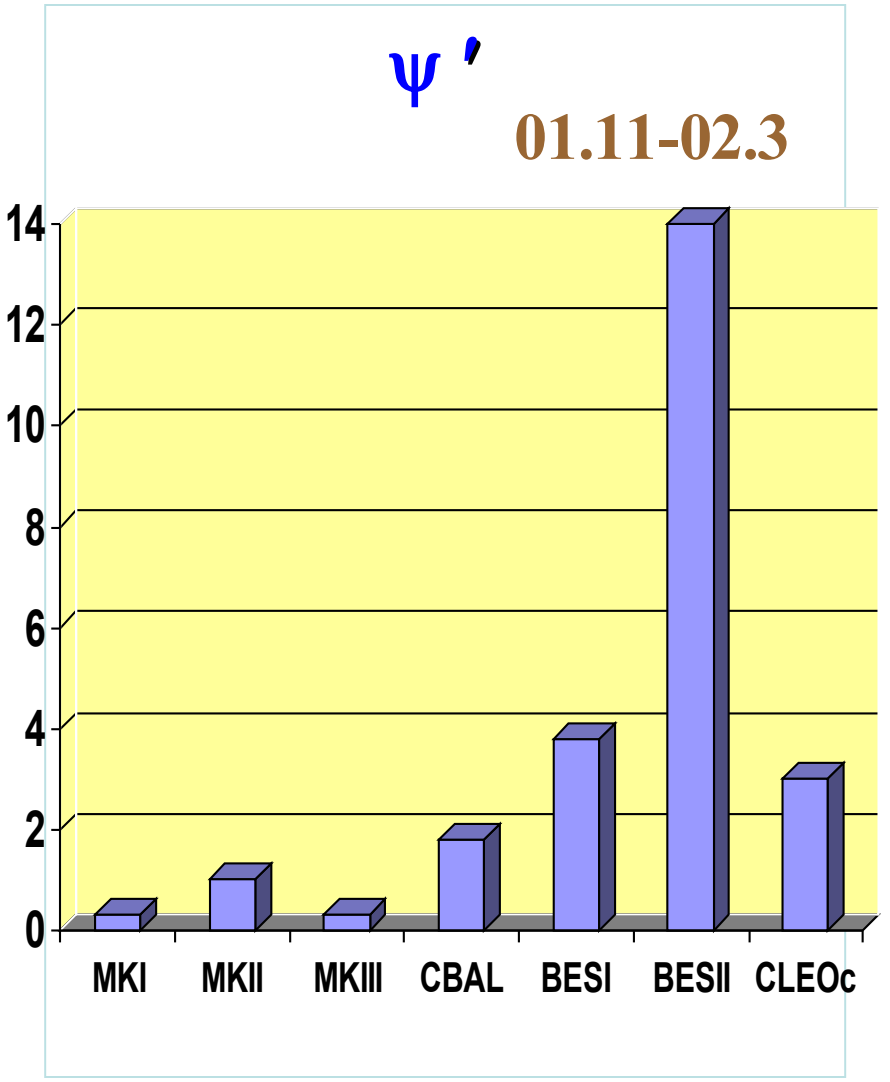
is independent of wave-function effects.



"ρπ puzzle"

World largest J/ψ and ψ′ data samples (10^6)





Extensively studied by BESII

VP mode: $\rho\,\pi$, $K^{*+}K^{-}$+c.c., $K^{*0}K^{0}$+c.c., $\omega\pi^{0}$,...

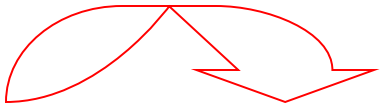
PP mode: K_SK_L, $K^{+}K^{-}$, $\pi^{+}\pi^{-}$

VT mode: $K^{*}K^{*}_{2}$, $\phi f_2'$, $\rho a2$, ωf_2

3-body: $pp\bar{p}\pi^{0}$, $pp\bar{p}\eta$, $p\bar{n}\pi^{-}$, $\bar{p}n\pi^{+}$, ...

Multi-body: $\pi^{+}\pi^{-}\pi^{0}\,K^{+}K^{-}$, $3(\pi^{+}\pi^{-})$, ...

Radiative mode: $\gamma K\bar{K}\pi$, $\gamma\eta\pi\pi$



$\psi' \rightarrow$ VP : suppressed

$\psi' \rightarrow$ PP : enhanced/suppressed

$\psi' \rightarrow$ VT : suppressed

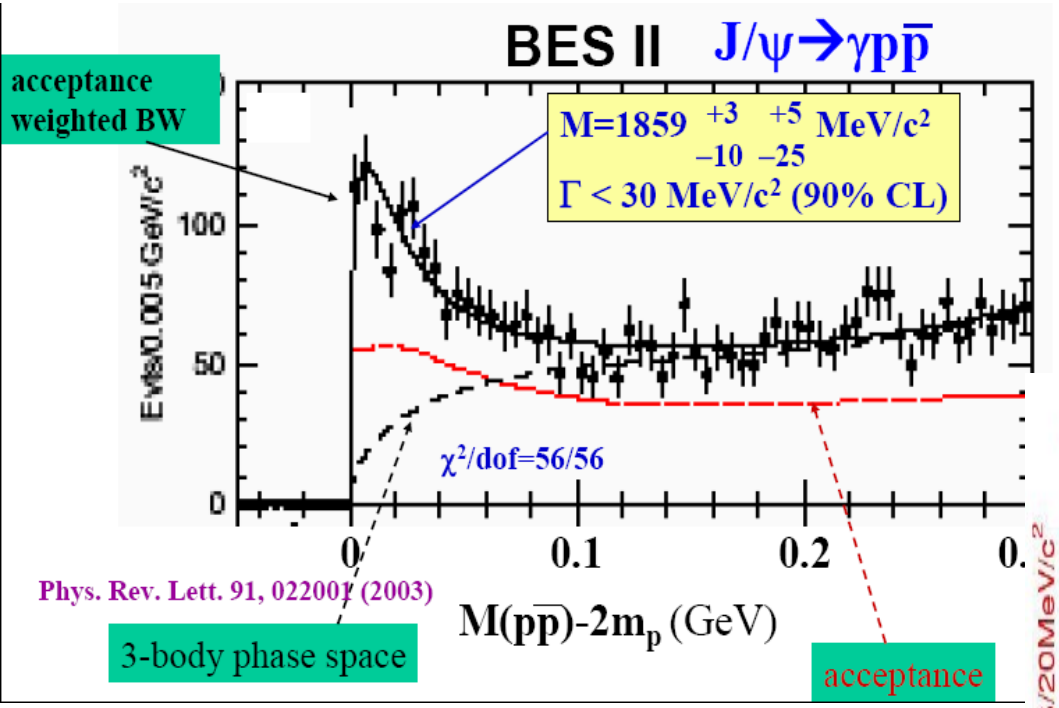
Multi-body : obey/sup

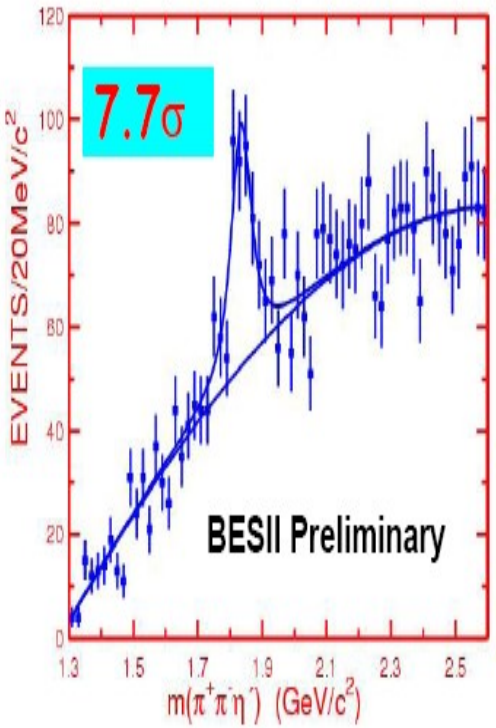
Radiative : enhanced/suppressed

Is there a rule here?

Selected results from BES (4)

- Light hadron spectroscopy





The $\pi^+\pi^-\eta'$ mass spectrum for η' decaying into $\eta'\to\pi^+\pi^-\eta$ and $\eta'\to\gamma\rho$

$N_{obs} = 264 \pm 54$

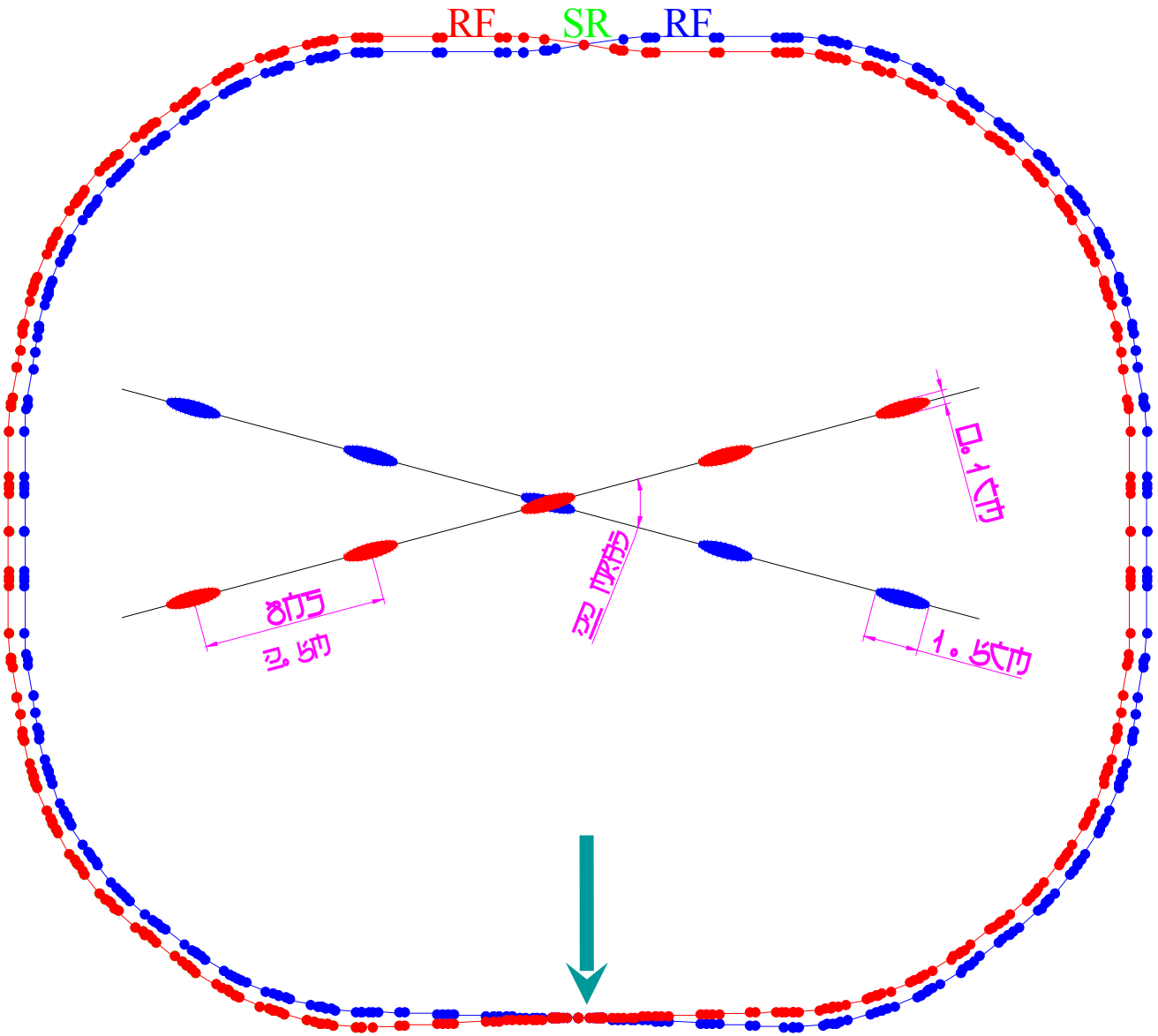
$m = 1833.7 \pm 6.1 \pm 2.7 MeV$

$\Gamma = 67.7 \pm 20.3 \pm 7.7 MeV$

BEPCII and BESIII upgrade

- The state council approved the upgrade plan in 2003, total budget 650M RMB
- Upgrade BEPC to a tau-charm factory: BEPCII
- Build a state of art detector: BESIII
- First physics run in 2008

BEPC II Storage ring: Large angle, double-ring



Beam energy:
1.0-2.3 GeV

Luminosity:
1×10^{33} $cm^{-2}s^{-1}$

Optimum energy:
1.89 GeV

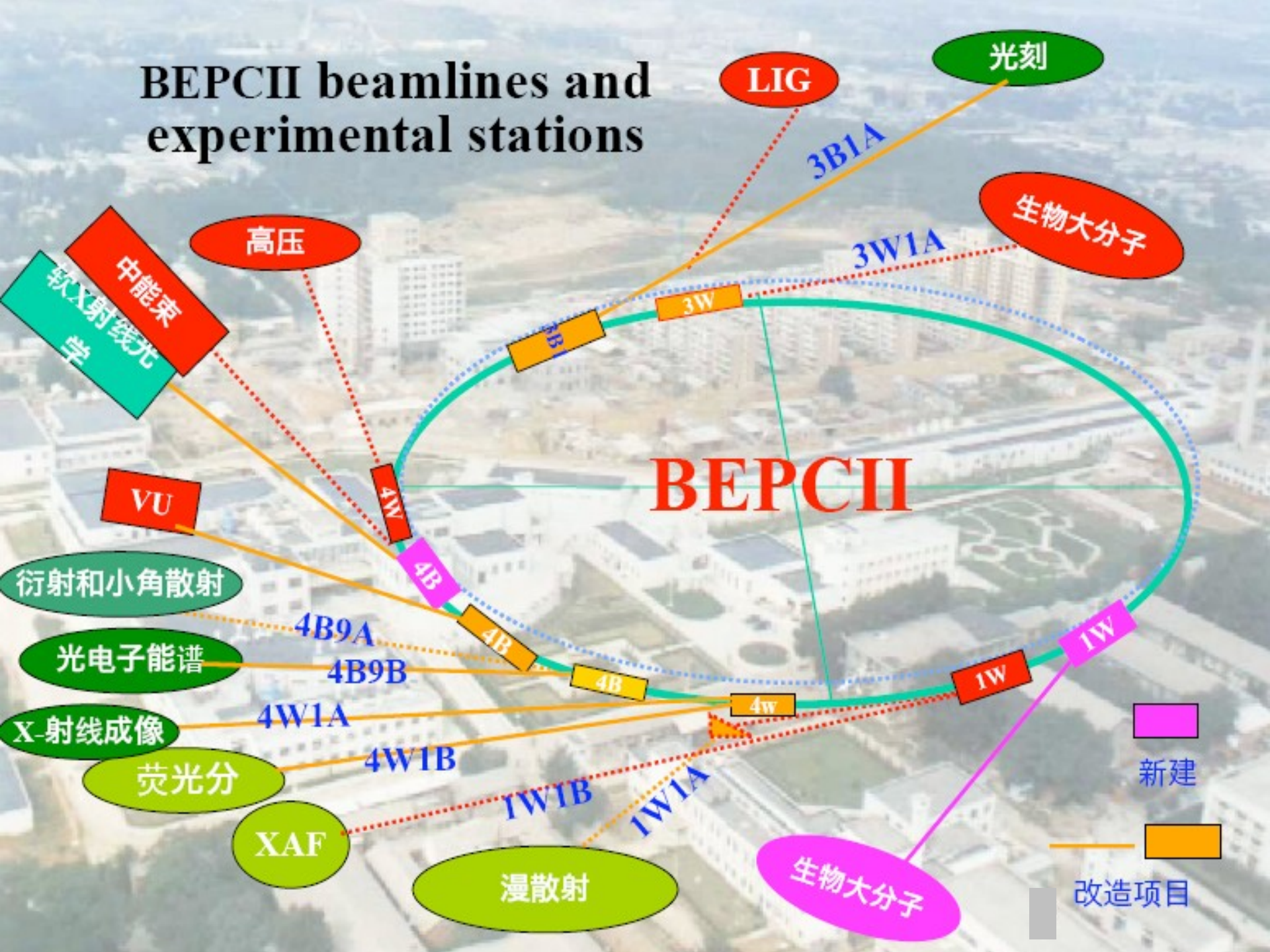
Energy spread:
5.16×10^{-4}

No. of bunches:
93

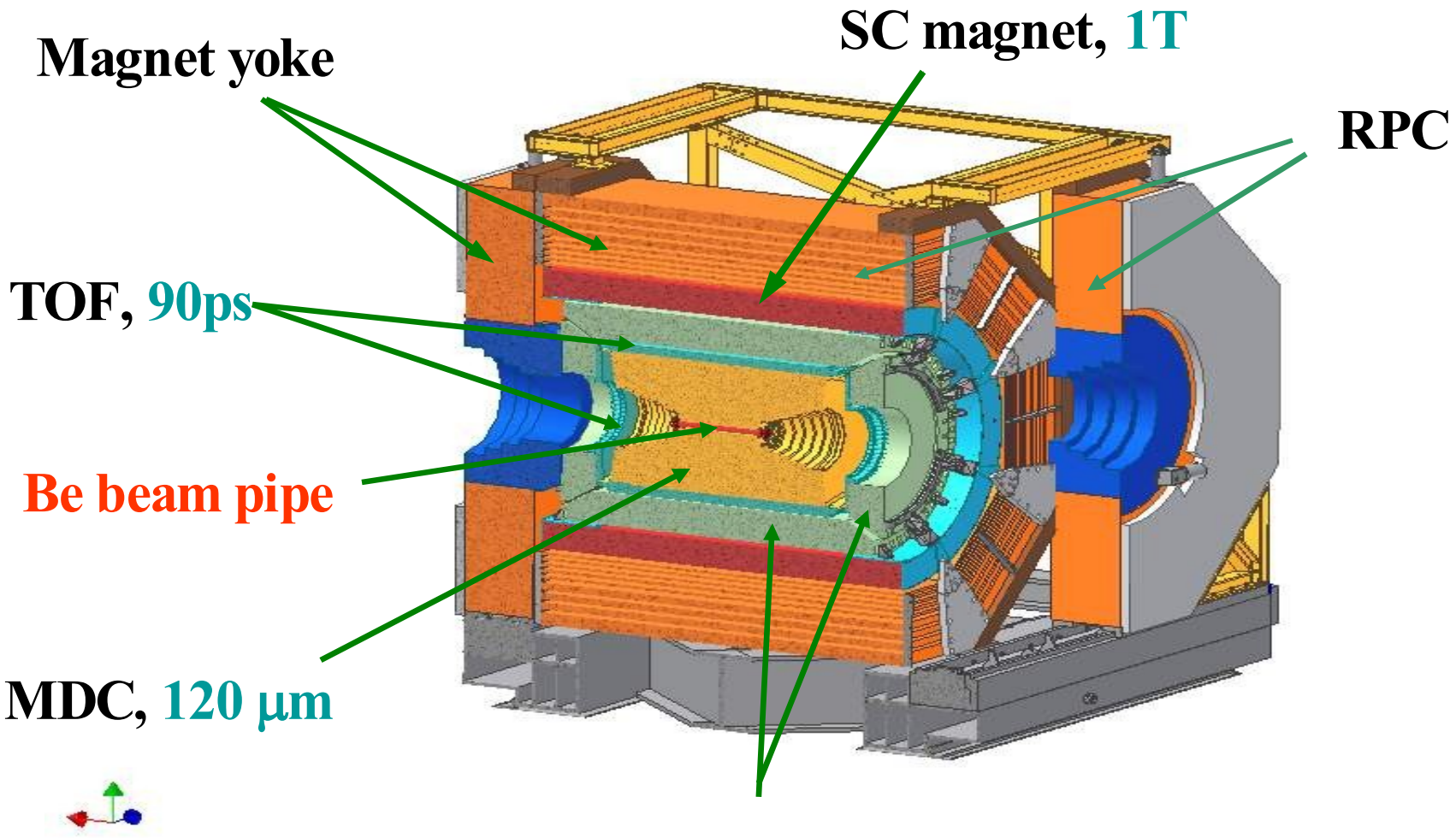
Bunch length:
1.5 cm

Total current:
0.91 A

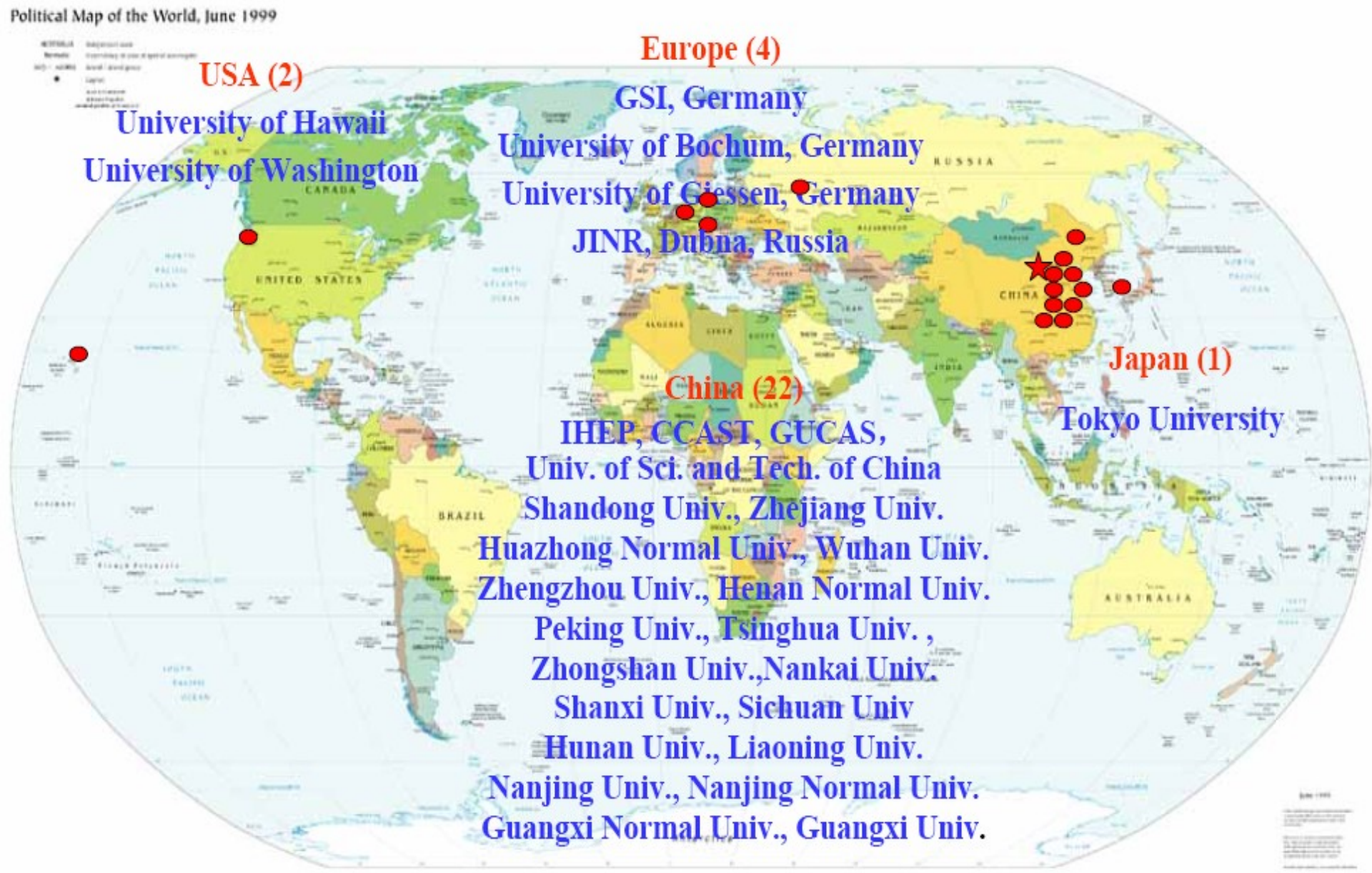
SR mode:
0.25A @ 2.5 GeV


BEPCII beamlines and experimental stations
BEPCII
LIG
光刻
3B1A
生物大分子
3W1A
高压
中能束
软X射线光学
3W
3B
4W
4B
VU
衍射和小角散射
4B9A
光电子能谱
4B9B
4W1A
X-射线成像
4W1B
荧光分
XAF
1W1B
1W1A
漫散射
生物大分子
1W
新建
改造项目

The BESIII Detector



BESIII Collaboration



- Drift chamber and its electronics (IHEP, Sichuan, Tsinghua)
- CsI(Tl) calorimeter and its electronics (IHEP, Tsinghua)
- TOF（IHEP, USTC，Tokyo，Hawaii）
- TOF electronics （USTC）
- RPC（IHEP, Uni. of Washington）
- RPC electronics（USTC）
- Trigger（IHEP, USTC）
- DAQ & online software (IHEP, Tsinghua)
- Offline software （IHEP, Peking，Shangdong，Nanjing）
- Superconducting magnet （IHEP，Wang NMR）
- Mechanics (IHEP)
- Technical support (IHEP, Tsinghua）

Physics at BEPCII/BESIII

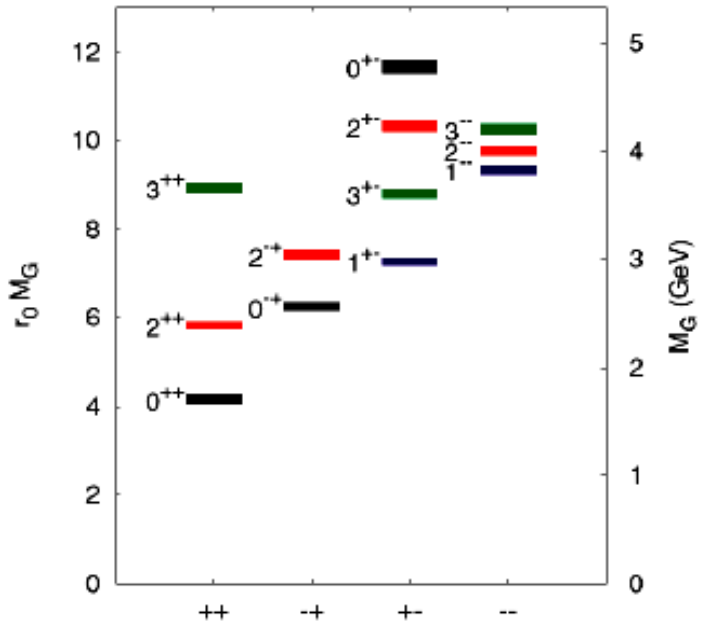
- Precision measurement of CKM matrix elements
- Precision test of The Standard Model
- QCD and hadron production
- Light hadron spectroscopy
- Charmonium physics
- Search for new physics/new particles

A review book on tau-charm physics at BESIII ~ 800 pages, to be completed this year

Physics Channel	Energy (GeV)	Luminosity (10^{33} $cm^{-2}s^{-1}$)	Events/year
J/ψ	3.097	0.6	1.0×10^{10}
τ	3.67	1.0	1.2×10^{7}
ψ'	3.686	1.0	3.0×10^{9}
D*	3.77	1.0	2.5×10^{7}
Ds	4.03	0.6	1.0×10^{6}
Ds	4.14	0.6	2.0×10^{6}

Light hadron spectroscopy

- Baryon spectroscopy
- Glueball searches
- Search for non-qqbar states



Spectrum of glueballs from LQCD

10^{10} J/ψ events is probably enough to pin down most of problems of light hadron spectroscopy

0^{++} : 1710 ± 50 ± 80

Also:
1611 ± 30 ± 160 Michael '98
1550 ± 50 ± ? Bali et al. '93

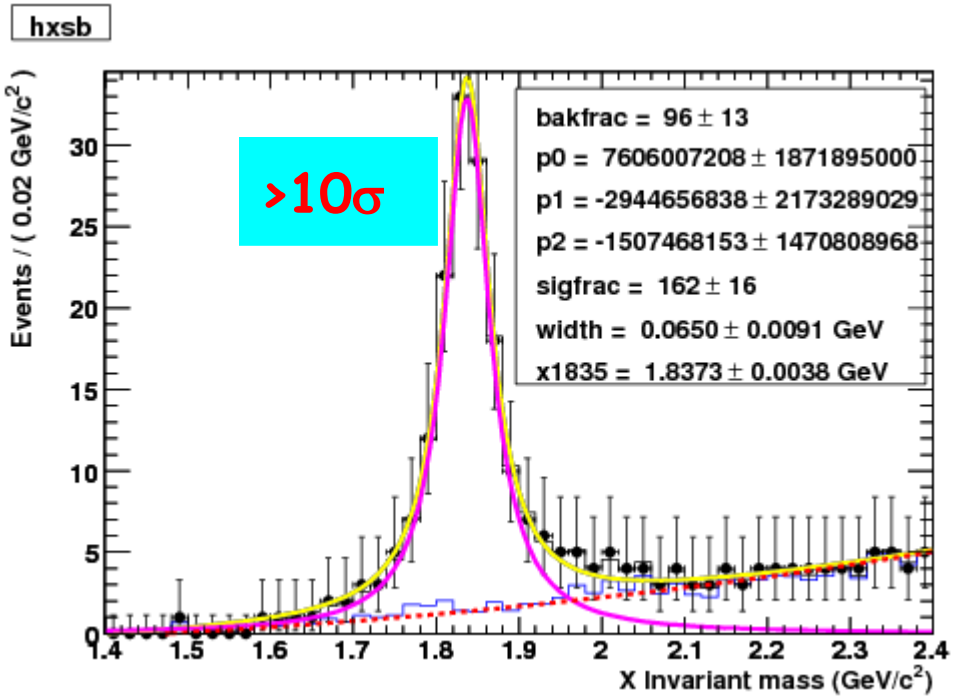
Example 1

X(1835) at BESIII via $J/\psi \to \gamma\eta'\pi^+\pi^-, \eta' \to \eta\pi^+\pi^-$

58M J/ψ data

at BESIII

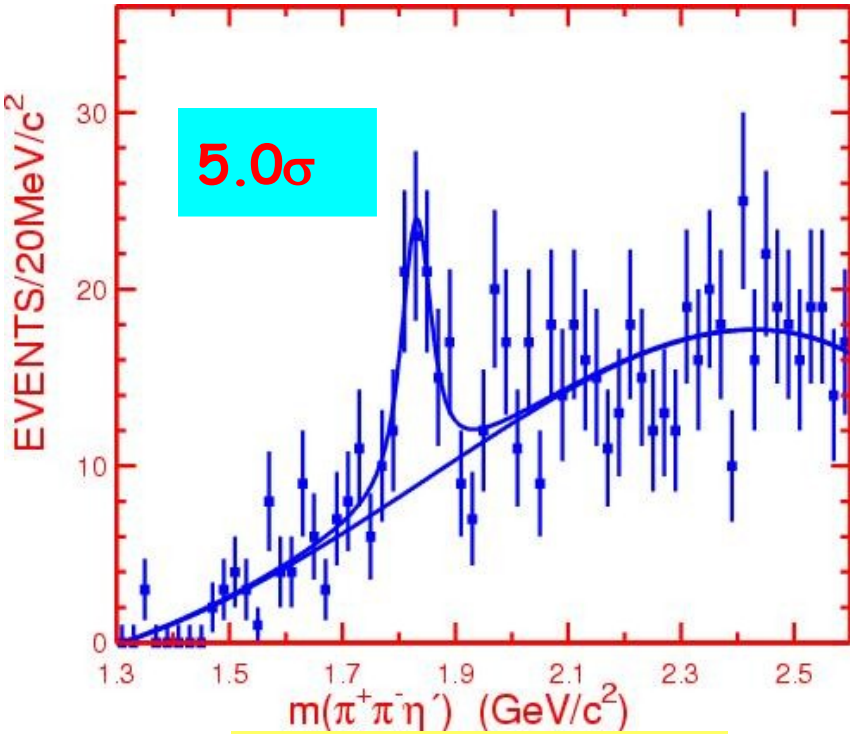
2.5 days' data taking



M(η'ππ) GeV/c²

at BESII

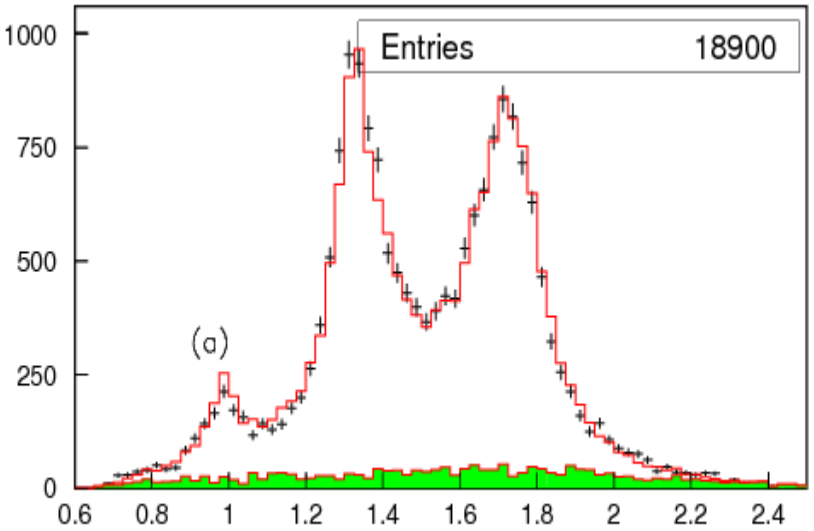
2 years' data taking



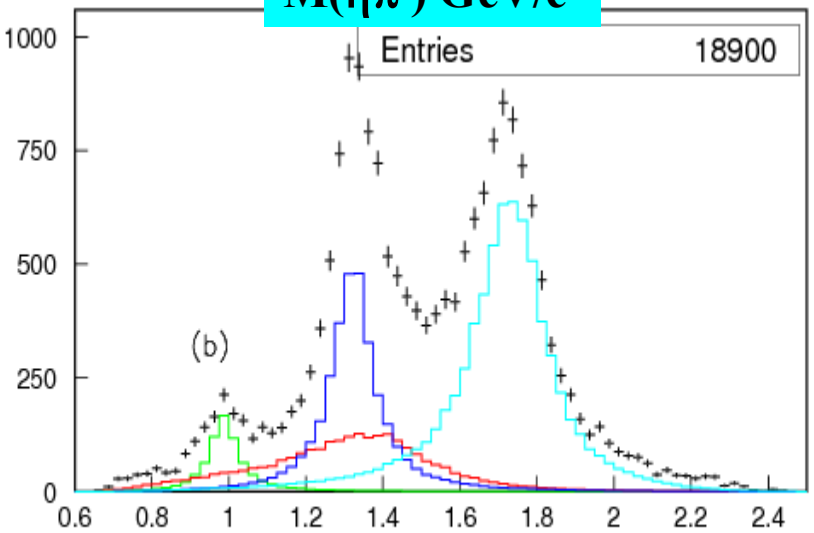
M(η'ππ) GeV/c²

Example 2

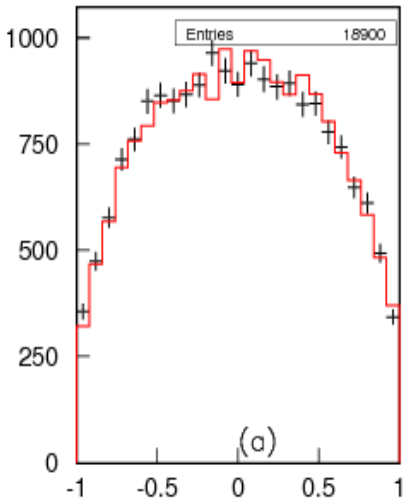
Search for 1^{-+} via $J/\psi \to \rho^0 X$, $X \to \eta\pi^0$



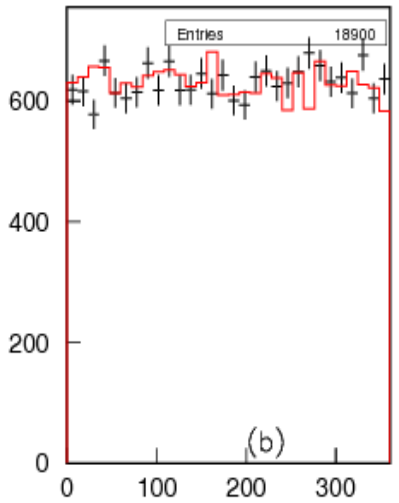
$M(\eta\pi^0)$ GeV/c^2



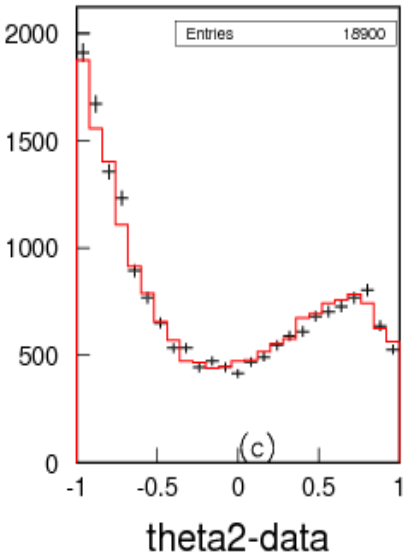
$M(\eta\pi^0)$ GeV/c^2



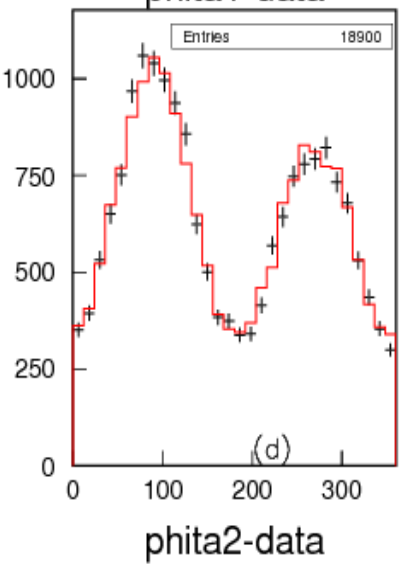
theta1-data



phita1-data



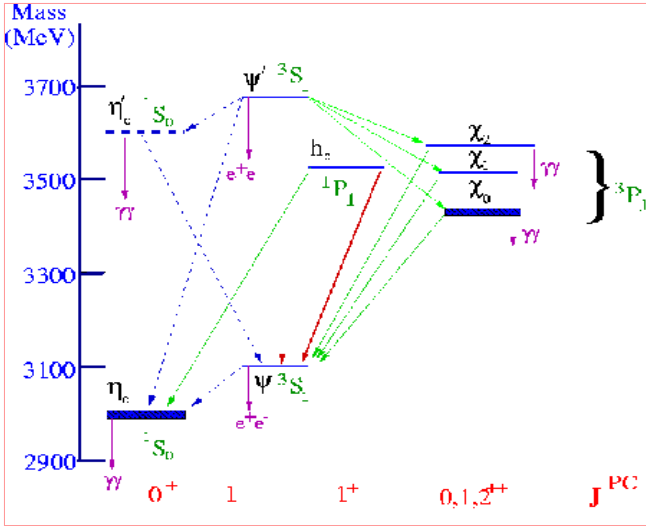
theta2-data



phita2-data

Charmonium physics

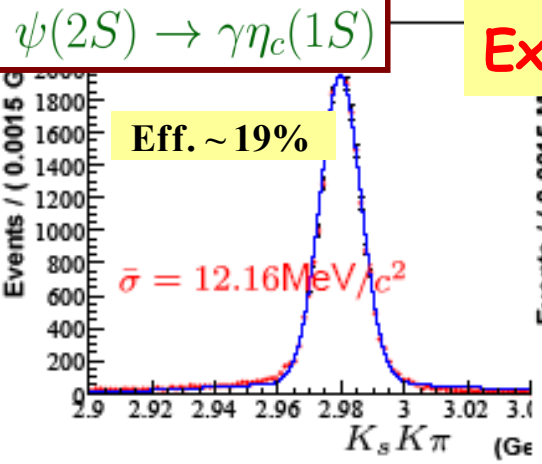
- Understand charmonium spectroscopy and charmonium decay dynamics
  - Hadronic transition
  - Radiative transition
  - Study of spin-singlets (h_c, η_c, η_c')
  - Hadronic decays and pQCD rule
  - Radiative decays and non-qqbar states
  - …

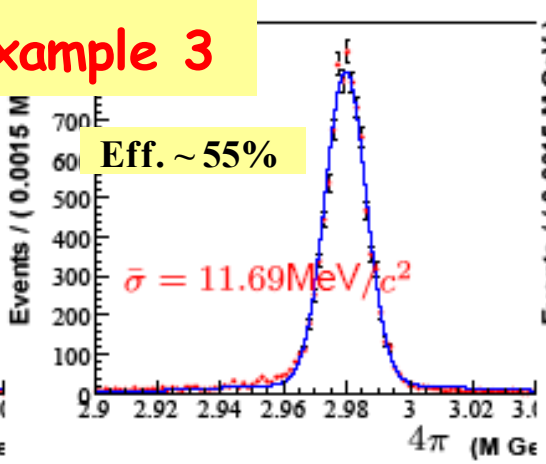


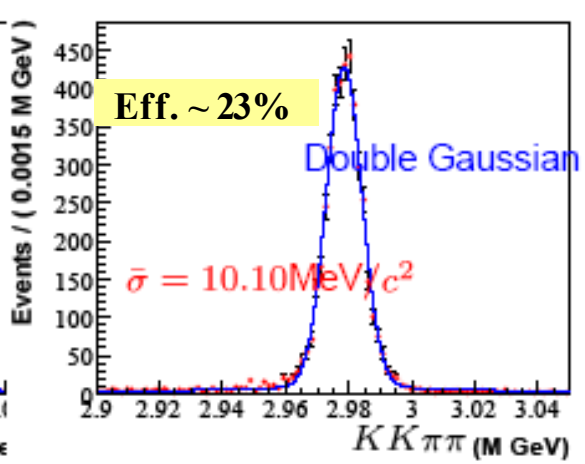
- Search for rare decays and new phenomena

Example 3

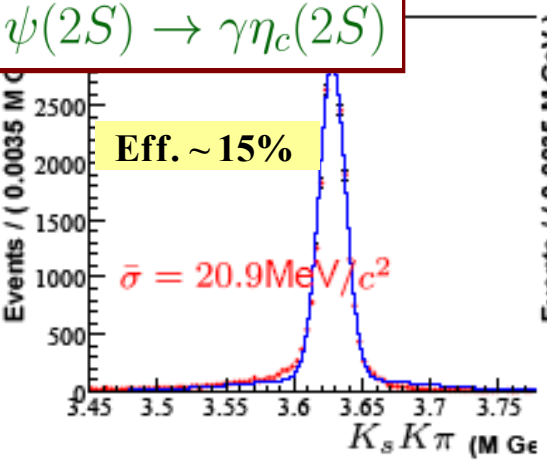
$\psi(2S) \to \gamma\eta_c(1S)$

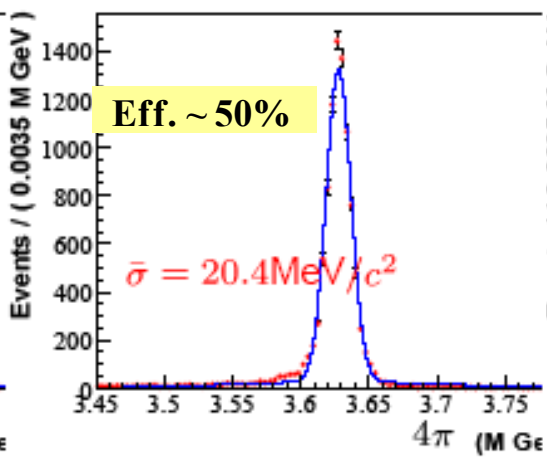


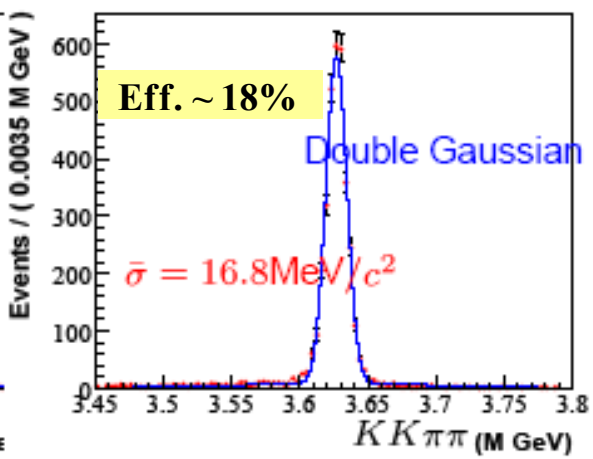




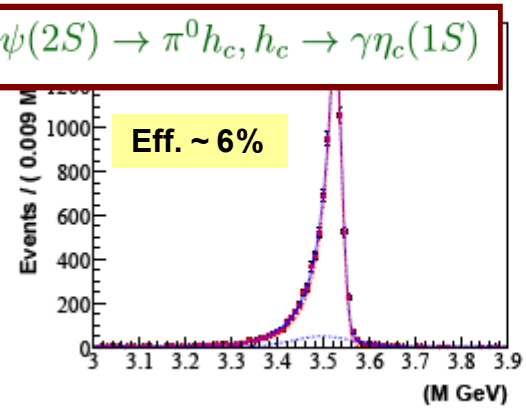
$\psi(2S) \to \gamma\eta_c(2S)$

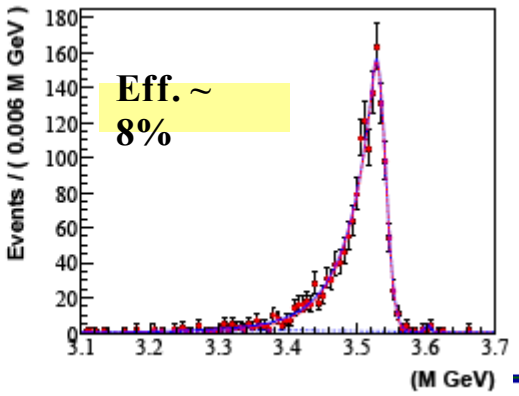


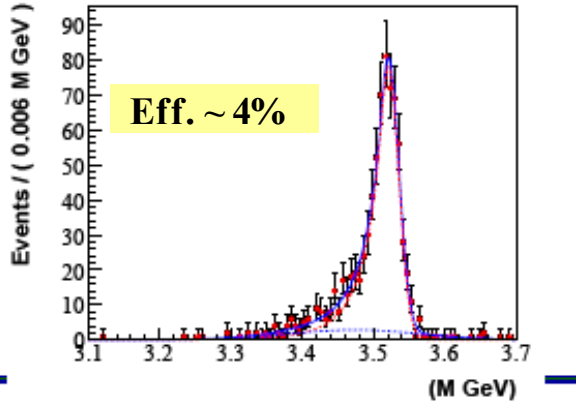




$\psi(2S) \to \pi^0 h_c, h_c \to \gamma\eta_c(1S)$







Precision measurement of CKM

---- Branching rations of charm mesons

- V_{cd} /V_{cs}: Leptonic and semi-leptonic decays
- V_{cb}: Hadronic decays
- V_{td} /V_{ts}: f_D and f_{Ds} from Leptonic decays
- V_{ub}: Form factors of semi-leptonic decays
- Unitarity Test of CKM matrix

	Current	BESIII
V_{ub}	25%	5%
V_{cd}	7%	1%
V_{cs}	16%	1%
V_{cb}	5%	3%
V_{td}	36%	5%
V_{ts}	39%	5%

Example 4

Some simulation results

Short summary

281 pb^{-1}

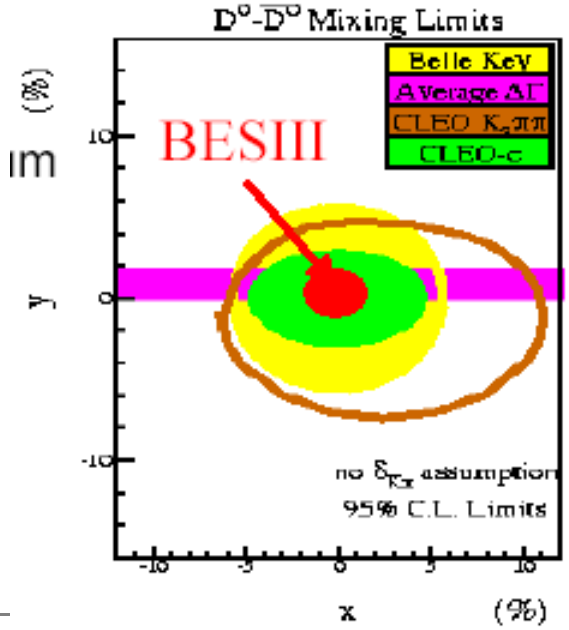
Relative error (%) on the measurements

Mode	$\delta B/B$ (4 fb^{-1})	$\delta B/B$ (20 fb^{-1})	$\delta B/B$ (PDG 04)	CLEO-c
$D^0 \to K^-\pi^+$	0.5	0.2	2.3	
$D^+ \to K^-\pi^+\pi^+$	0.5	0.2	6.5	
$D^0 \to K^-e^+\nu$	0.7	0.3	5.0	
$D^0 \to \pi^-e^+\nu$	1.8	0.8	16.6	
$D^0 \to K^-\mu^+\nu$	0.9	0.4		
$D^0 \to \pi^-\mu^+\nu$	2.1	1.0		
$D^+ \to \mu^+\nu$	4.0	2.0	~100	15.0
f_{D^+}	2.0	0.9		7.5

Mode	$\delta B/B$ (4 fb^{-1})	$\delta B/B$ (20 fb^{-1})	$\delta B/B$ (PDG 06)	
$D_S^+ \to \phi\pi^+$	4.0	1.8	14	
$D_S^+ \to \phi e^+\nu$	5	2.2	17	
$D_S^+ \to \mu^+\nu$	5.7	2.5	18	
$D_S^+ \to \tau^+\nu$				
$f_{D_S^+}$	2.8	1.3	9	

Precision test of the Standard Model and Search for new Physics

- **DDbar mixing**
  - DDbar mixing in SM ~ 10^{-3} - 10^{-10}
  - DDbar mixing sensitive to "new physics"
  - Our sensitivity : ~ 10^{-4}
- **Lepton universality**
- **CP violation**
- **Rare decays** FCNC, Lepton no. violation, …

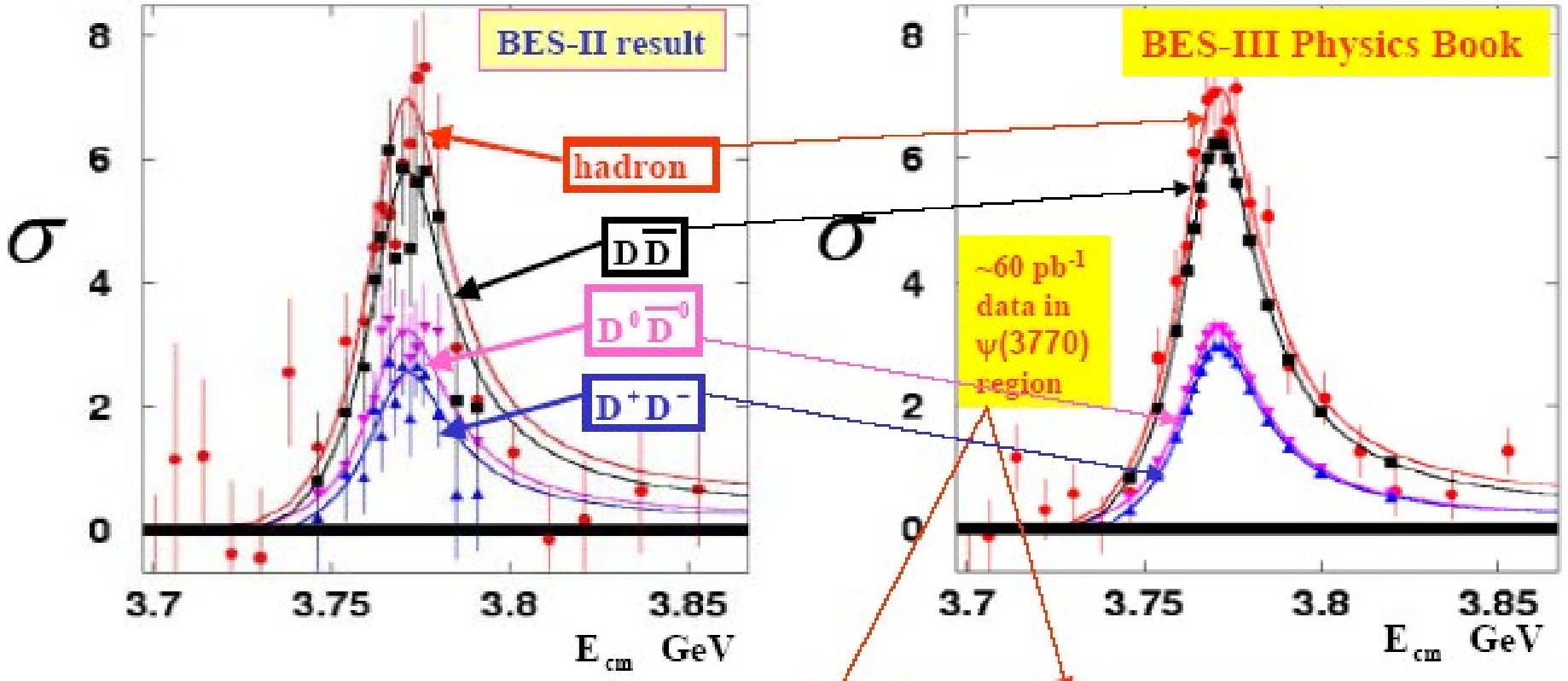


$D^0\overline{D}^0$ Mixing

Reaction	Events Right Sign	Sensitivity of R_M
$\psi(3770) \to (K^-\pi^+)(K^-\pi^)$	87195	1×10^{-4}
$\psi(3770) \to (K^-e^+\nu)(K^-e^+\nu)$	94351	
$\psi(3770) \to (K^-e^+\nu)(K^-\mu^+\nu)$	166808	3.7×10^{-4}
$\psi(3770) \to (K^-\mu^+\nu)(K^-\mu^+\nu)$	83404	
$D^{*+}D^- \to [\pi_s^+(K^+e^-\overline{\nu})(K^+\pi^-\pi^-)]$	76000	
$D^{*+}D^- \to [\pi_s^+(K^+\mu^-\overline{\nu})(K^+\pi^-\pi^-)]$	60000	
$D^{*+}D^- \to [\pi_s^+(K^+e^-\overline{\nu})$(other D^- tag)]	60000	4.7×10^{-3}
$D^{*+}D^- \to [\pi_s^+(K^+\mu^-\overline{\nu})$(other D^- tag)]	60000	

Example 5

Scan of ψ(3770) peak



$\Gamma^{tot}_{\psi(3770)}$	26.8 ± 0.5 MeV	26.9 MeV
$\Gamma^{ee}_{\psi(3770)}$	256 ± 9 eV	251 eV
	Measured value	Input value

$B[\psi(3770) \to D\bar{D}]$	
$(88.2 \pm 2.4 \pm \sim 2.0)$ %	Measured value
89 %	Input value

QCD and hadron production

- R-value measurement
- Measurement of a_s at low energies
- Hadron production at J/ψ, ψ', and continium
- Multiplicity and other topology of hadron event
- BEC, correlations, form factors, resonance, etc.

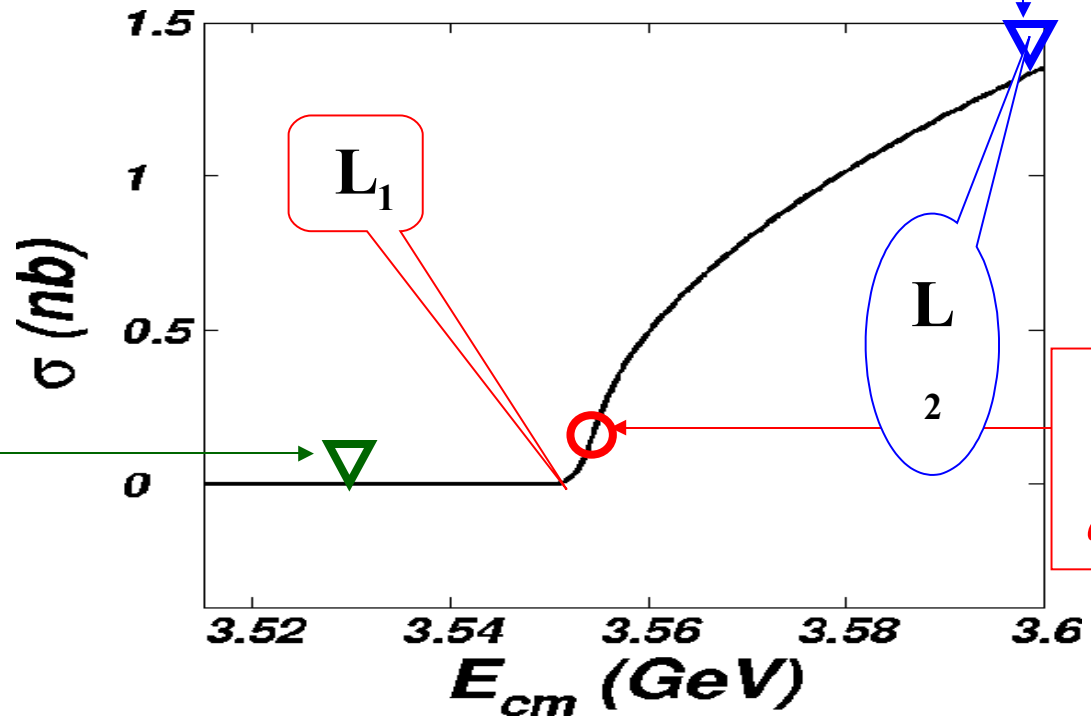
Error on R	$\Delta\alpha^{(5)}_{had}(M_Z^2)$
6%	0.02761 ±0.00036
3%	0.02761 ±0.00030
2%	0.02761 ±0.00029

Errors on R will be reduced to 2% from currently 6%

τ mass measurement

Data taking strategy

Event Selection & Eff. determination



$L_1:L_2=3:1$

BG. study

Optimal Point to determine m_τ

Current:

$m_\tau = 1776.96^{+0.18+0.25}_{-0.21-0.17}$ MeV

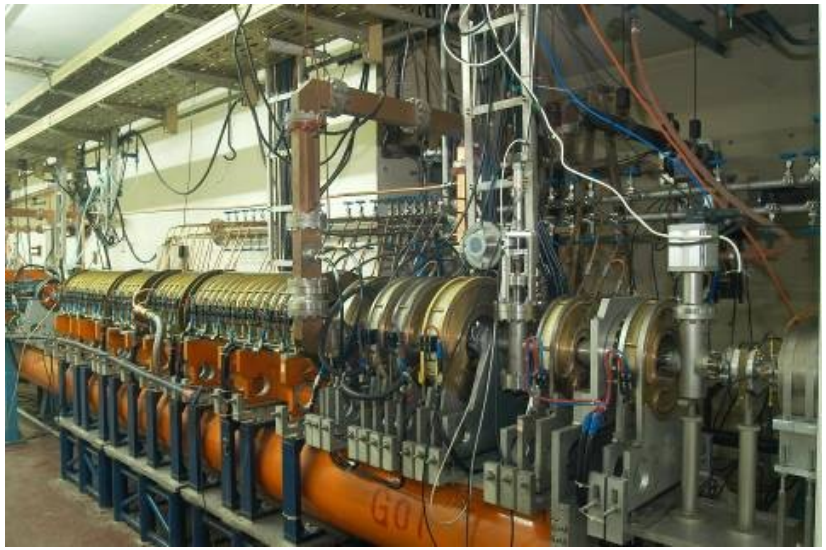
BESIII expected:

$\Delta m_\tau = 0.05 +- 0.09$ MeV

Using Compton scattering technique to measure the beam energy

Status of BEPCII (1)

- Linac installation and commissioning



Summary of the Linac commissioning

Parameters		Goal	Measured
Beam energy (GeV)		1.89	1.89 (e-); 1.89 (e+)
Beam current (mA)	e^+	40	40 - 63
	e^-	500	> 500
Repetition rate (Hz)		50	50
Emittance (1σ) (mm·mrad)	e^+	0.53	0.32 ~ 0.20
	e^-	0.067	0.080 ~ 0.096
Energy spread (%)	e^+	± 0.50	±0.73@1.30GeV (±0.50@1.89Gev)
	e^-	± 0.50	< ±0.80@1.30GeV < (±0.55@1.89Gev)

Status of BEPCII (2)

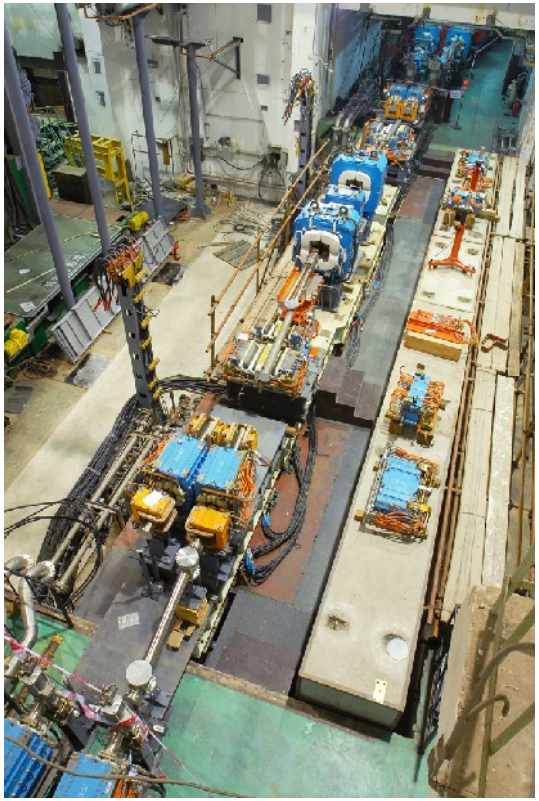
- Storage Ring: milestone and future plan

- Nov. 2006 Beam commissioning start
- Nov. 2006 Beam was stored in the storage ring
- Dec. 2006 Accumulated beam ~ 6 A·hrs.,
  beam life time ~ 1.5 hrs @ 60mA.
- Dec. 2006 Start to provide SR beams for users
- Mar. 2007 First e+e- collision, Lumi ~ 10^{30} cm^{-2} s^{-1}
- June 2007 Provide SR beams for users at 2.5GeV,
  200 mA with a lifetime of 5.5 hr
- Aug. 2007 Beam current reached 500 mA
- Oct. 2007 SCQ mapped and now at the interaction region

- Nov. 2007 Machine study
- Dec. 2007 Another SR run is planed at the end of the year
- Mar. 2008 Lumi. reach 10^{32} cm^{-2} s^{-1} and backgrounds acceptable
- Mar. 2008 BESIII detector to the interaction region

The BEPCII storage ring installation was completed in the beginning of Nov. 2006

Conventional magnets are installed in IR to start ring commissioning and SR operation

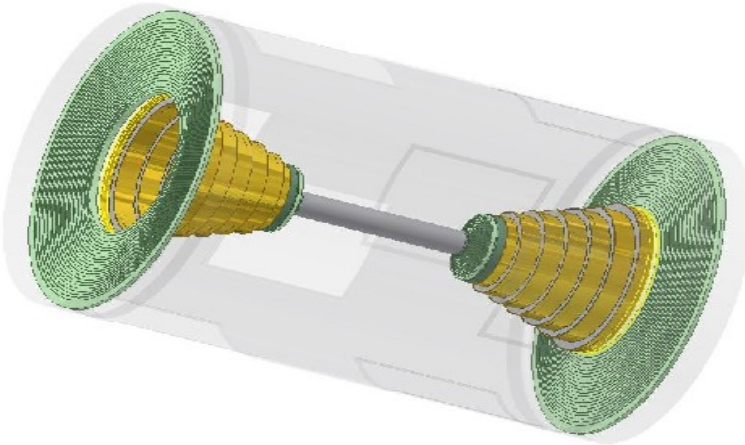


BESIII Status: Drift chamber

- Design spec.: Single wire reso. dE/dx reso.

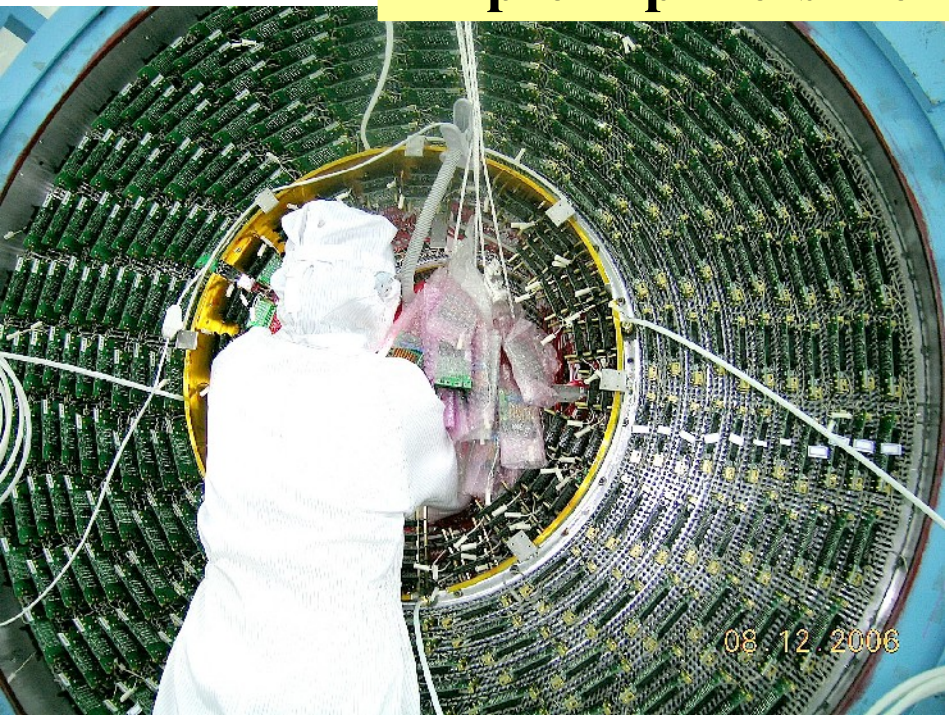
CLEO:	~110mm,	5.7%
Babar:	~110mm,	6.2%
Belle:	~130mm,	5.7%
BESIII	~120mm,	5-6%

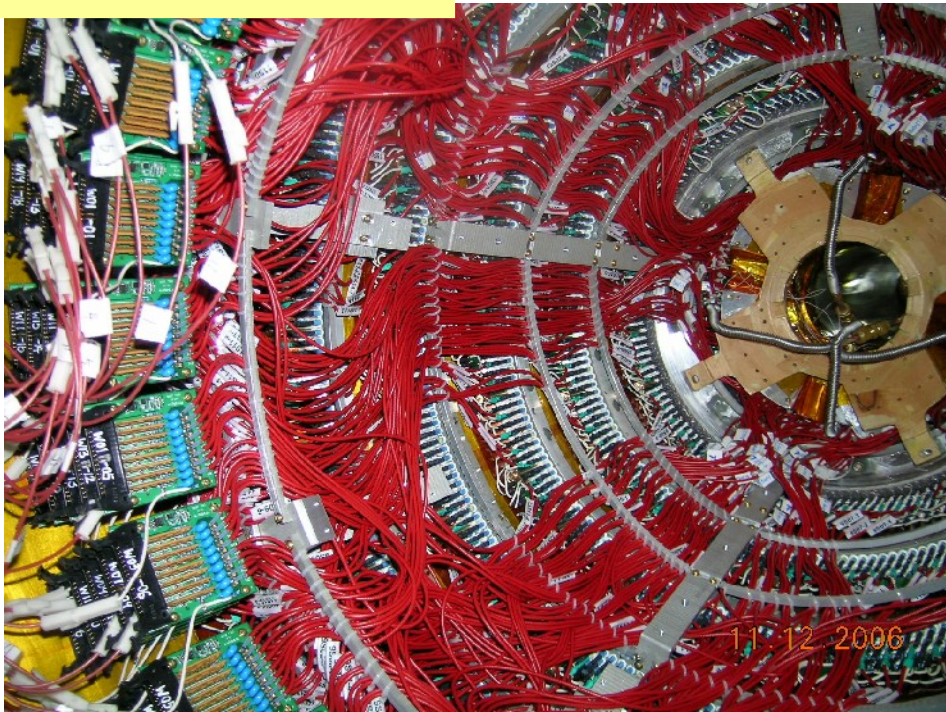
- R_{in} = 63mm; R_{out} = 810mm; length = 2400 mm
- 7000 Signal wires:
  25(3% Rhenium) mm gold-plated tungsten
- 22000 Field wires: 110 mm Al
- Gas: He + C_3H_8 (60/40)
- Momentum resolution@1GeV:



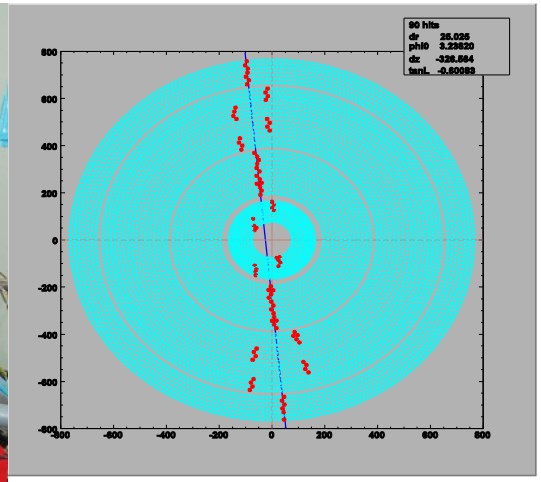
$$\frac{\sigma_{P_t}}{P_t} = 0.32\% \oplus 0.37\%$$

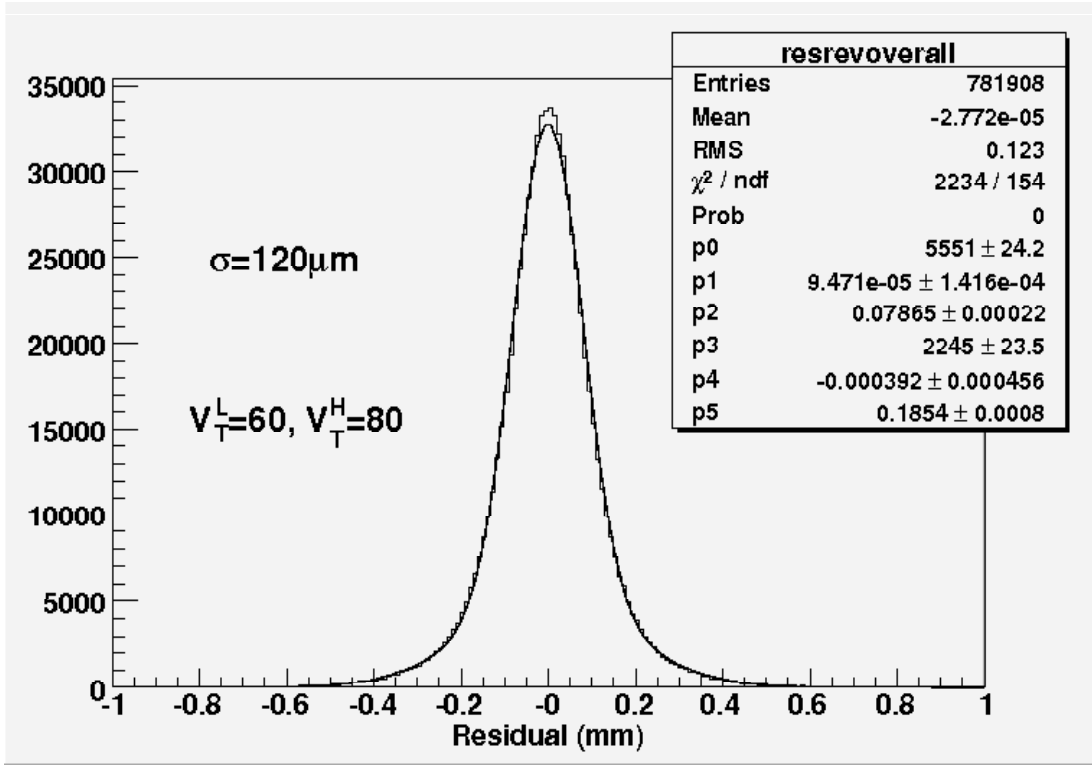
All preamplifiers are mounted and tested





Cosmic-ray tests completed





BESIII Status: Calorimeter

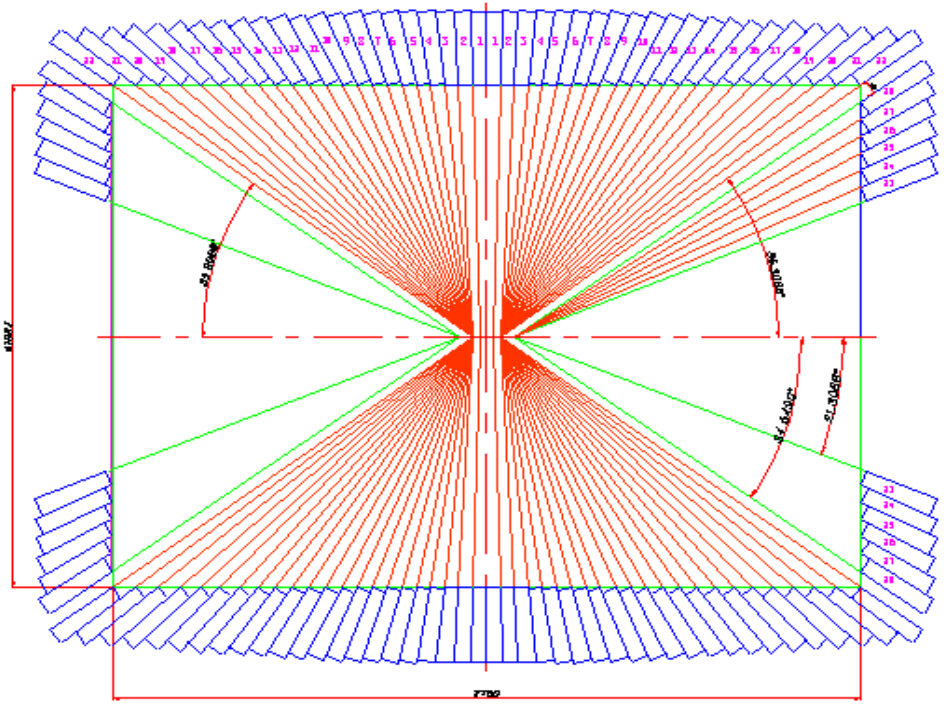
- Barrel: 5280 crystals Endcap: 960 crystals
- Crystal: (5.2x 5.2 – 6.4 x 6.4) x 28cm^3
- Readout: 13000 Photodiodes, 1cm×2cm,
- Energy range 20MeV – 2 GeV
- position resolution: 6 mm@1GeV
- Tiled angle: theta ~ 1-3°, phi ~ 1.5°

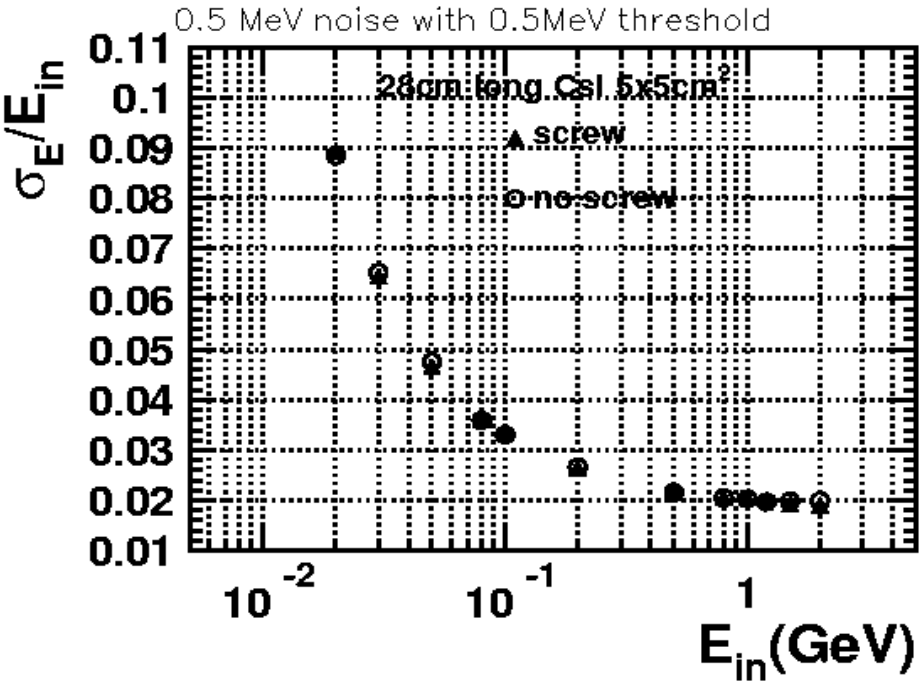
Babar: 2.67% @1GeV

BELLE: 2.2% @1GeV

CLEO: 2.2% @1GeV

BESIII: 2.5%@1GeV





Testing:

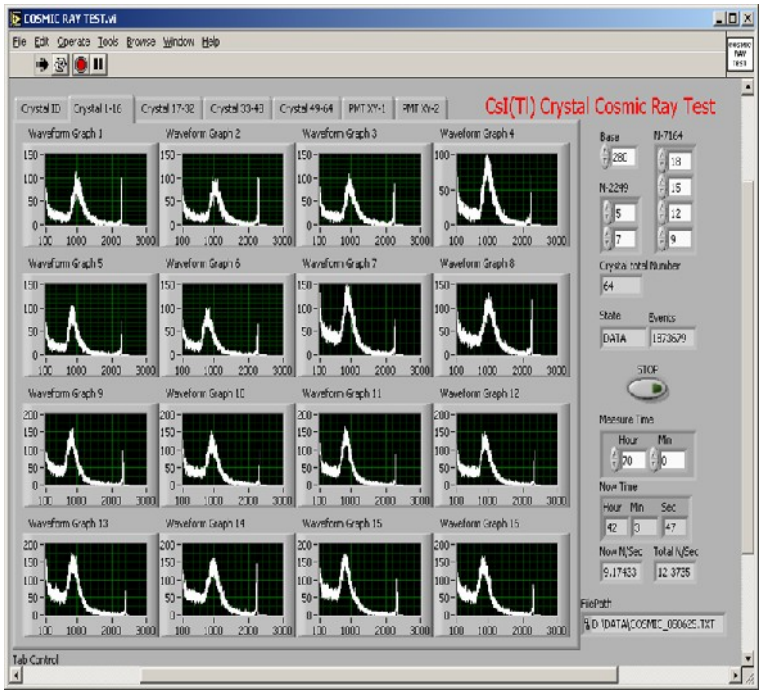
- Size
- Source tests (^{137}Cs)
- LED tests
- PD tests
- Preamp tests
- Cosmic ray tests
- Beam tests (6 x 6 array):

Energy resolution (1GeV)

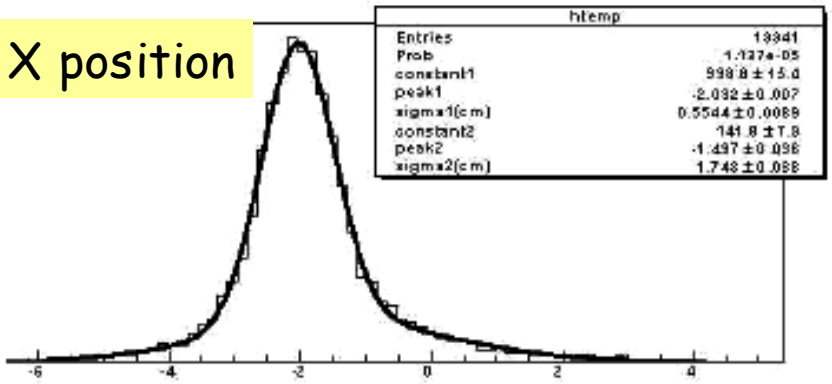
$\sigma_E = 2.62\ \%$

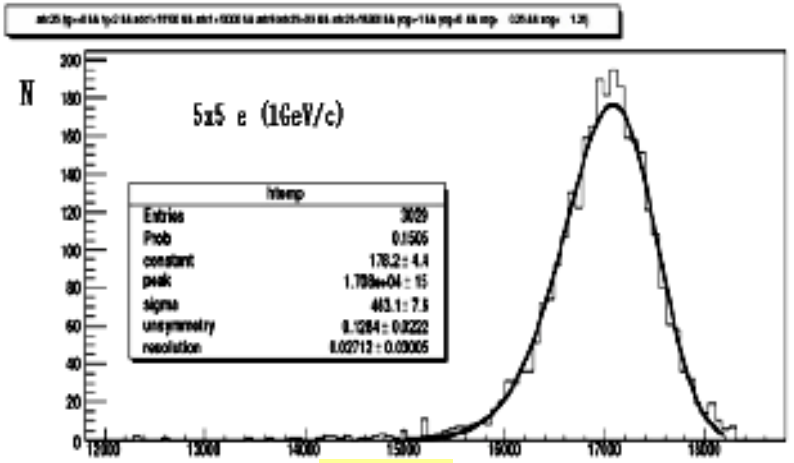
position resolution (1GeV)

$\sigma_{x-y} = 6\ mm$



X position

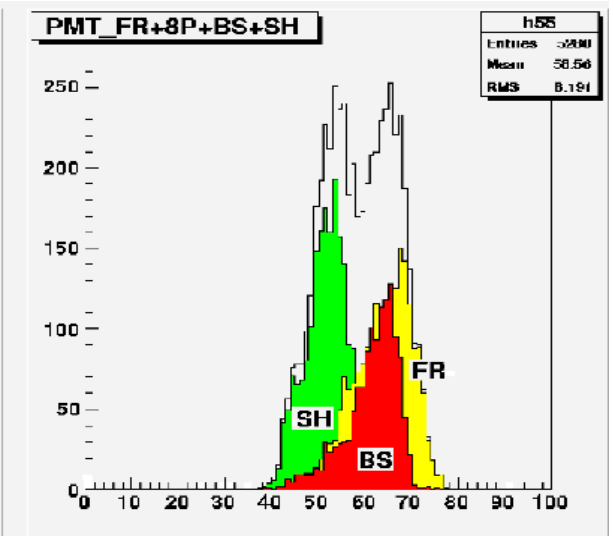


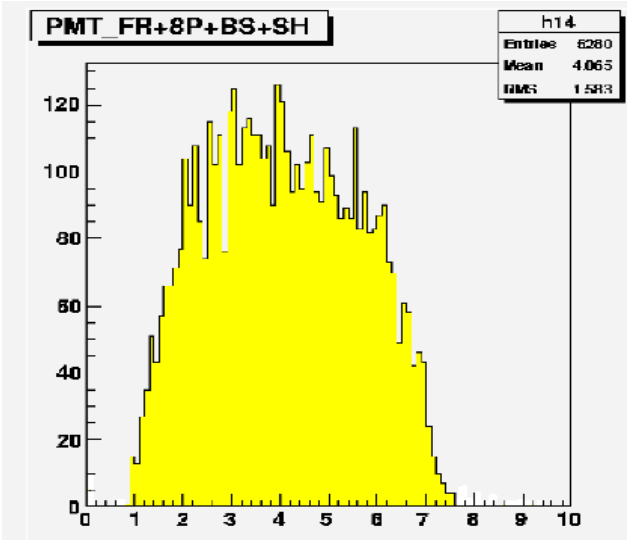


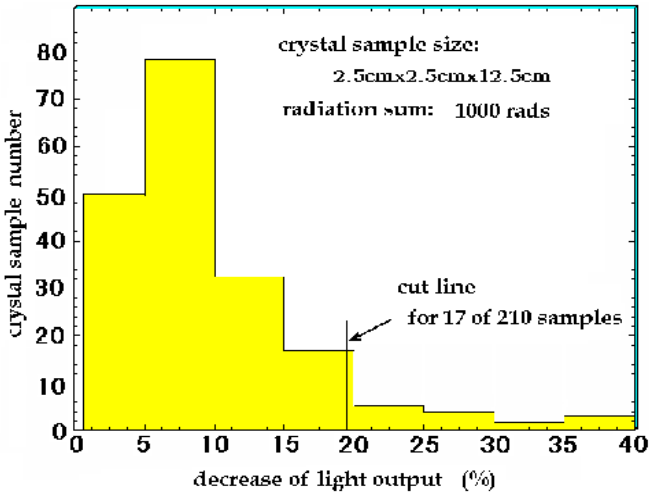
ADC

Crystal production and tests completed

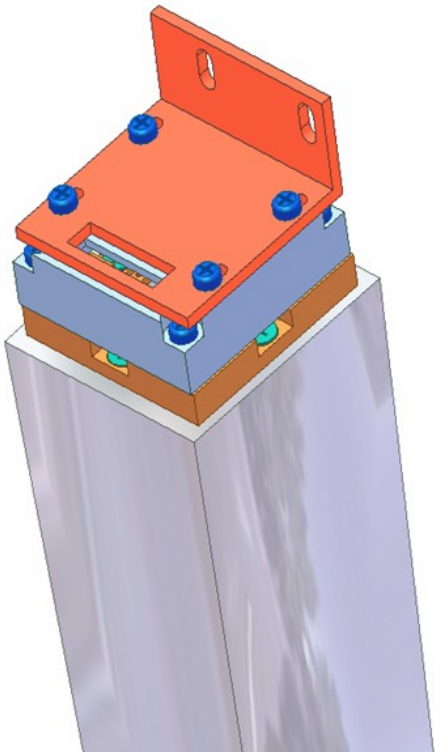
	France Sanit -Gobain	Shanghai Institute of Ceramics	Beijing Hamamatsu	Total
Ordered	2040(960)	1920	1320	5280(960)
Replaced	87(4)	316	79	482(4)

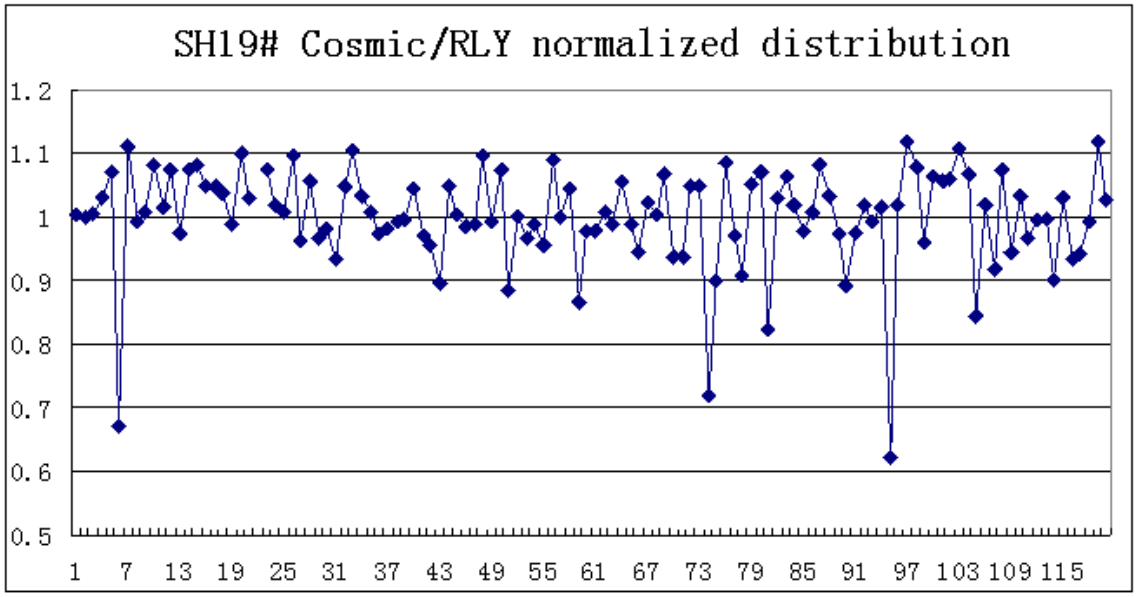


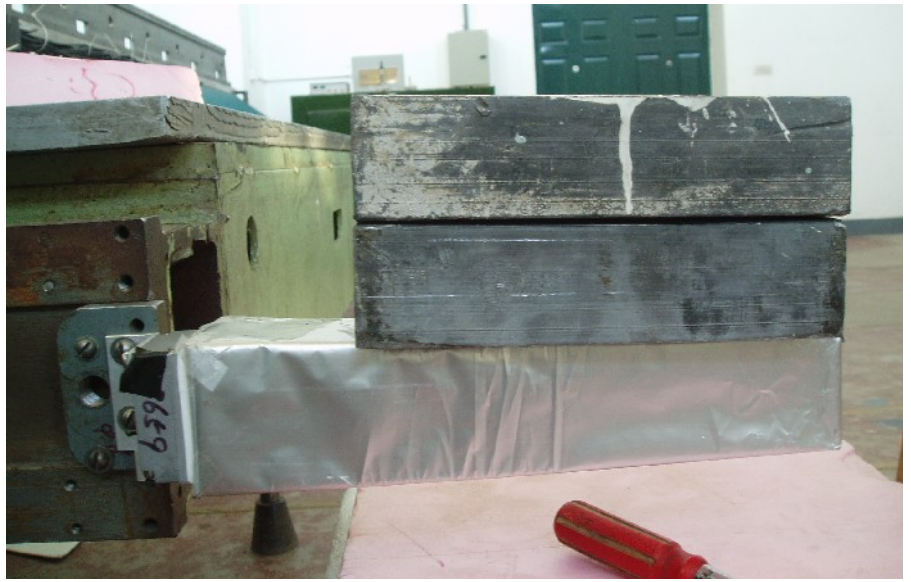




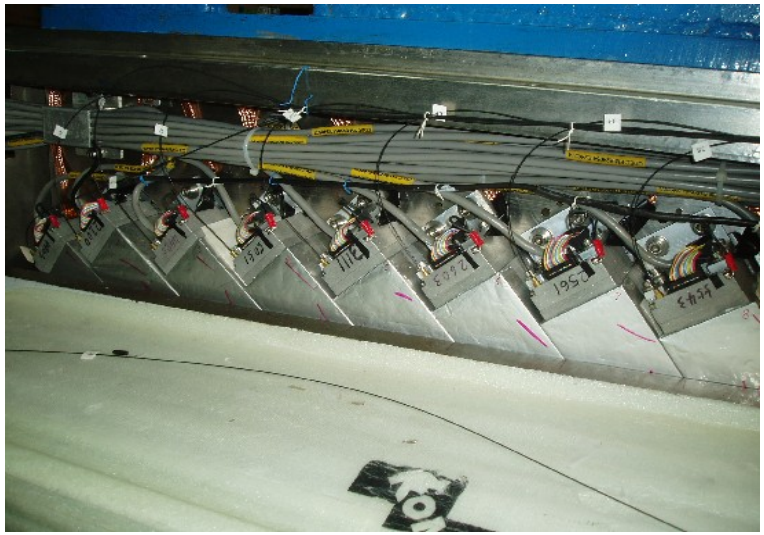
Crystal assembly completed

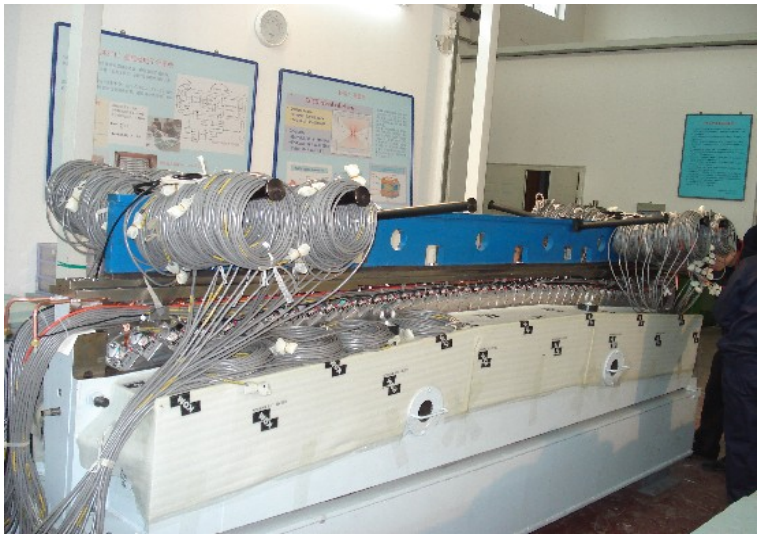


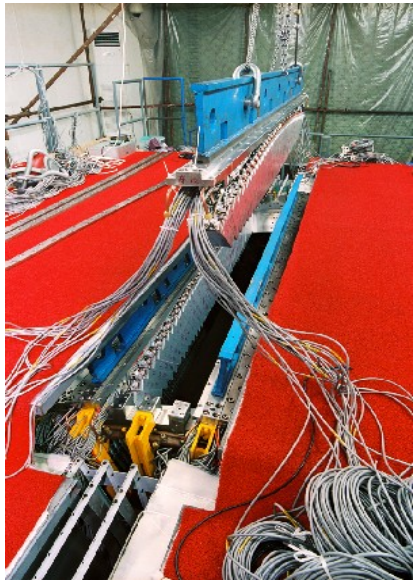


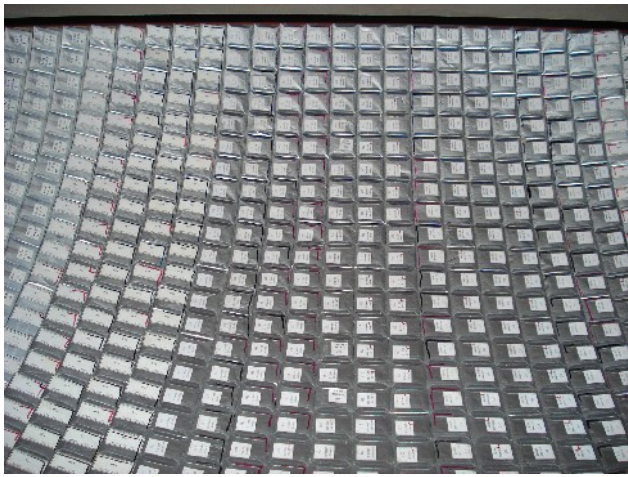


Barrel assembly completed

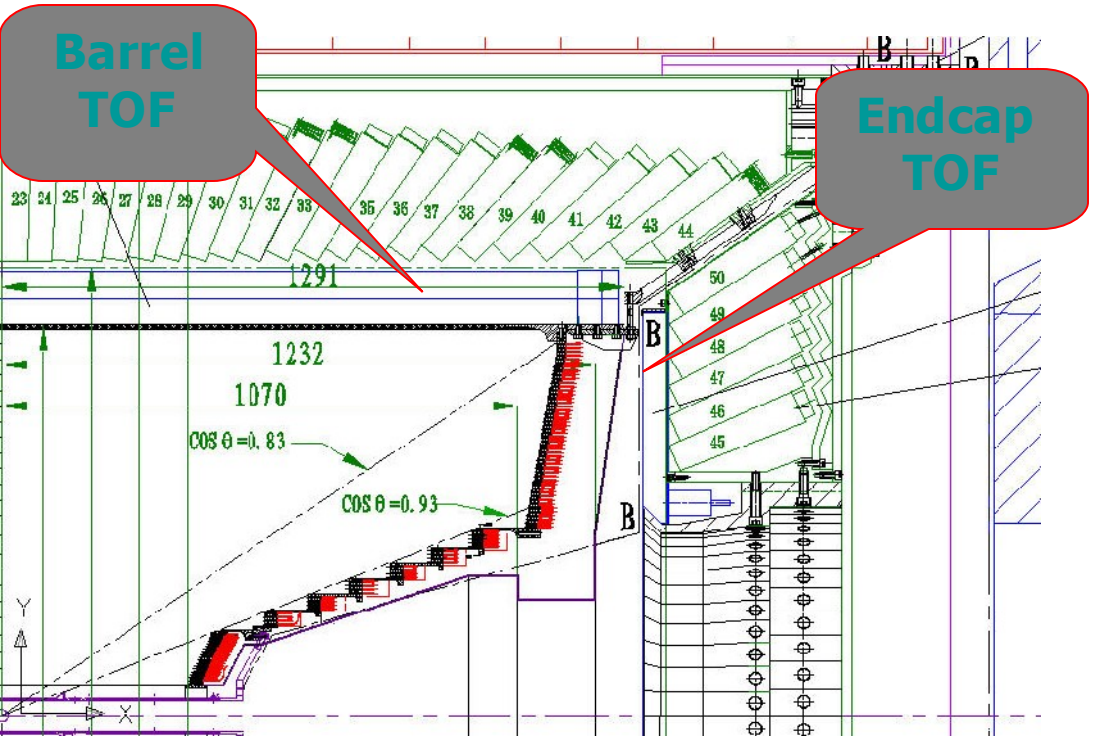


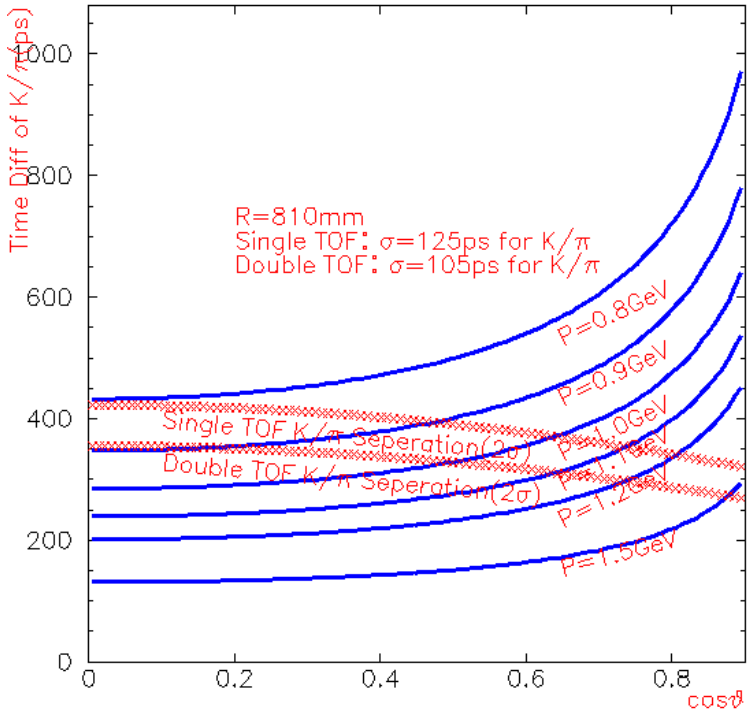




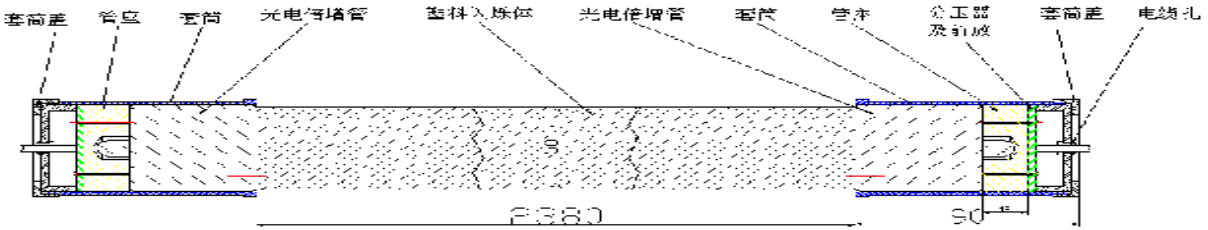


BESIII Status: Time-Of-Flight counters

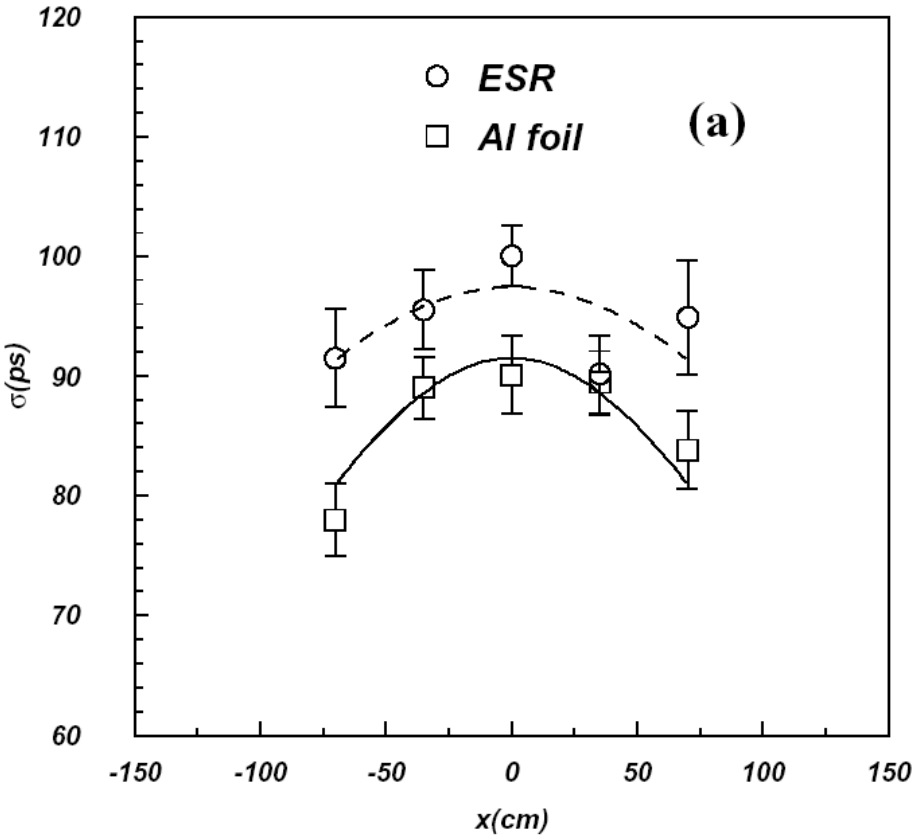


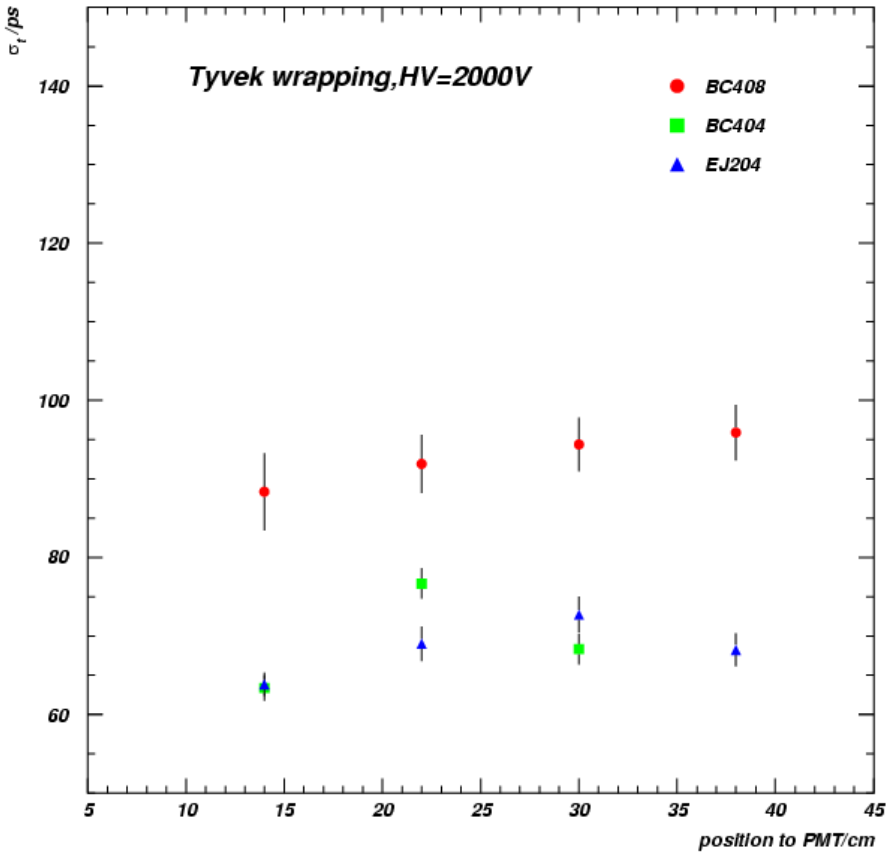


High quality plastic scintillator: 2.4 m long, 5cm thick



Test beam at IHEP: for various types of scintillators, thickness, wrapping materials, …

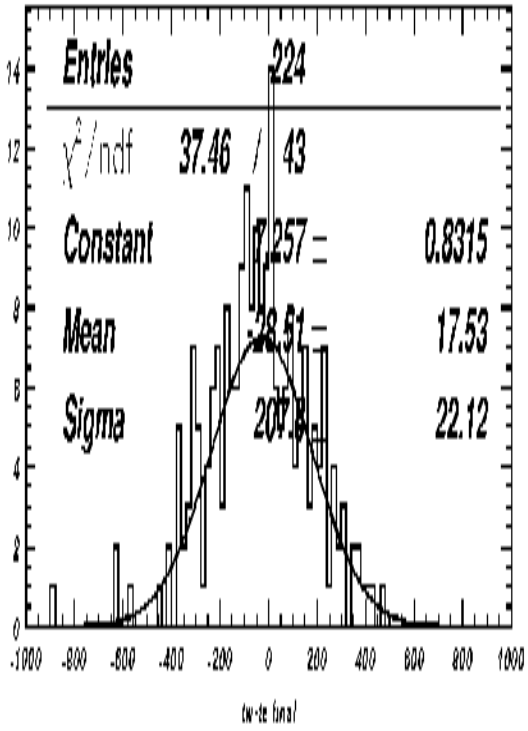




Barrel

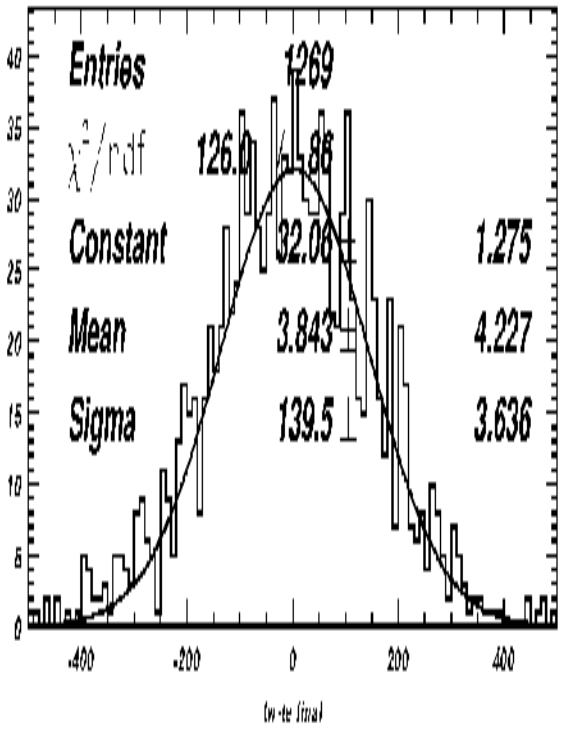
Endcap

Test beam at IHEP: for various types of scintillators, thickness, wrapping materials, …



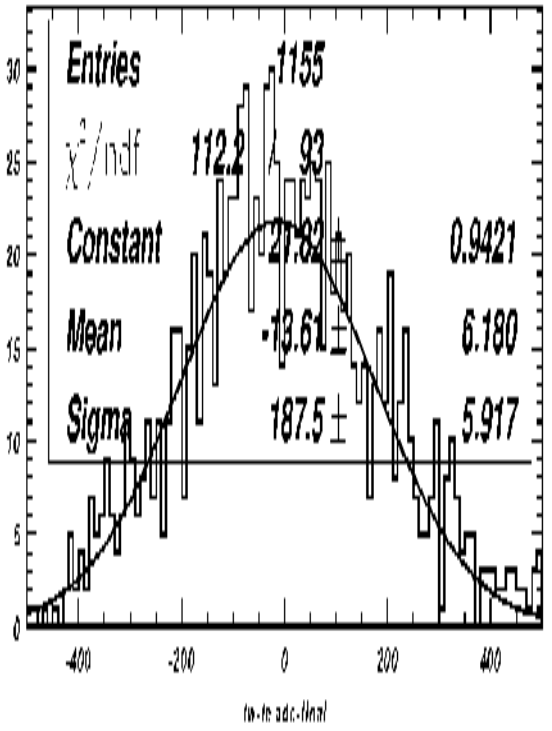
pions

104±11ps



protons

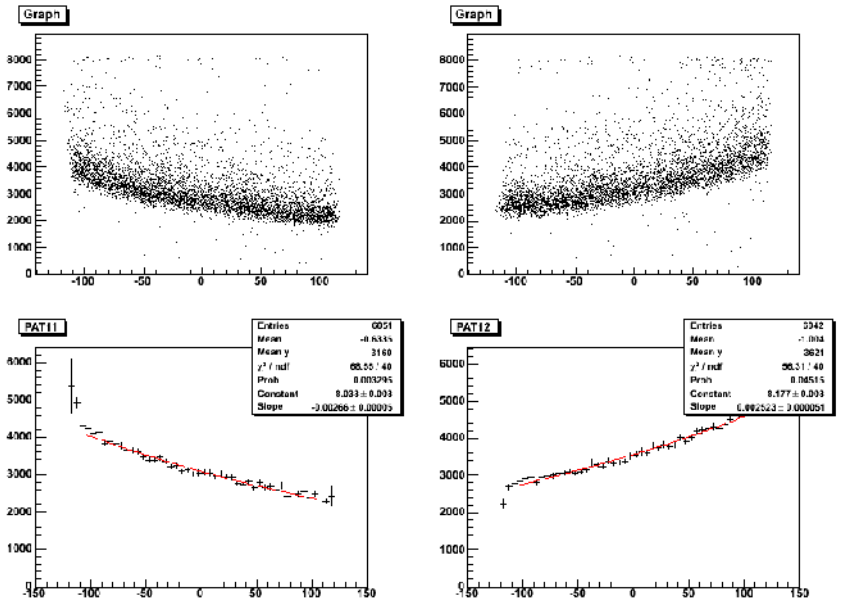
70±2ps



electrons

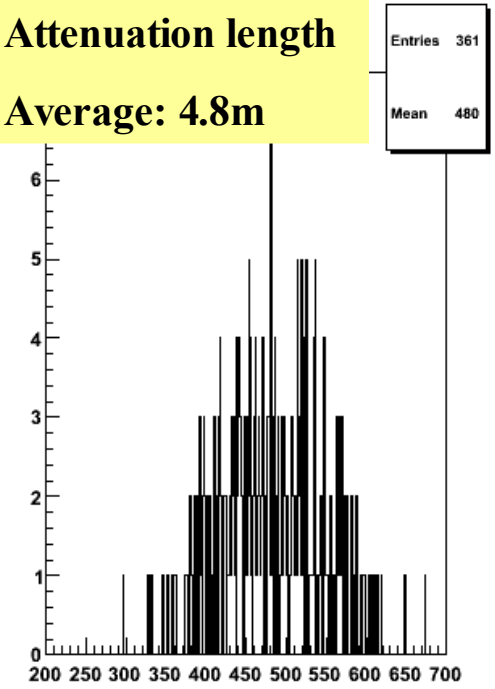
94±3ps

Scintillator tests completed

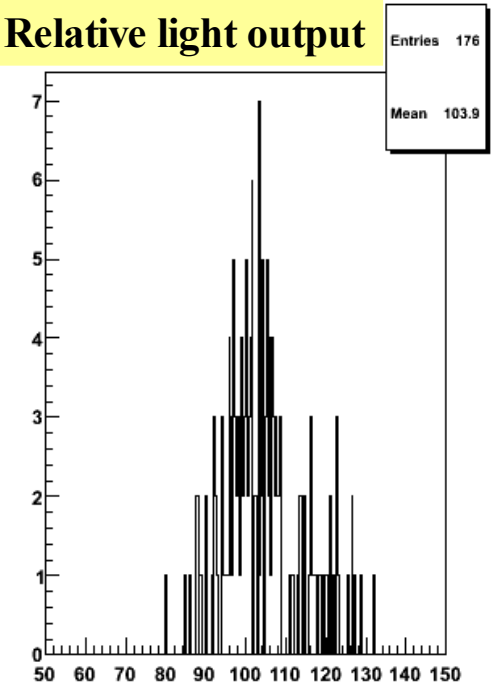


Attenuation length

Average: 4.8m



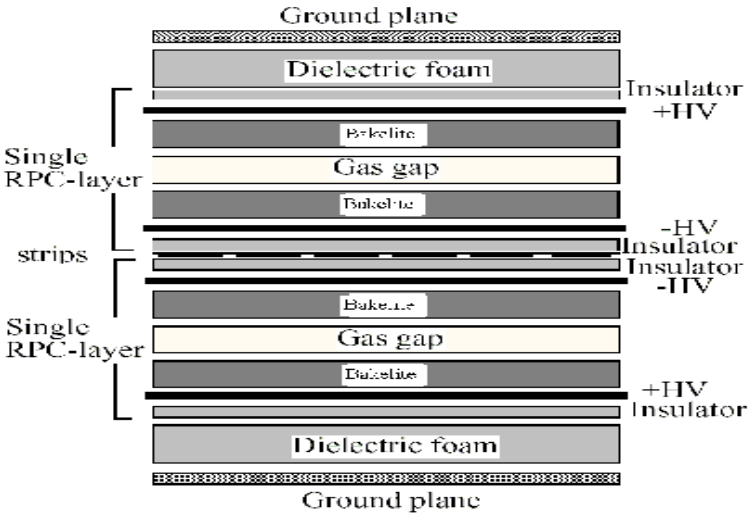
Relative light output

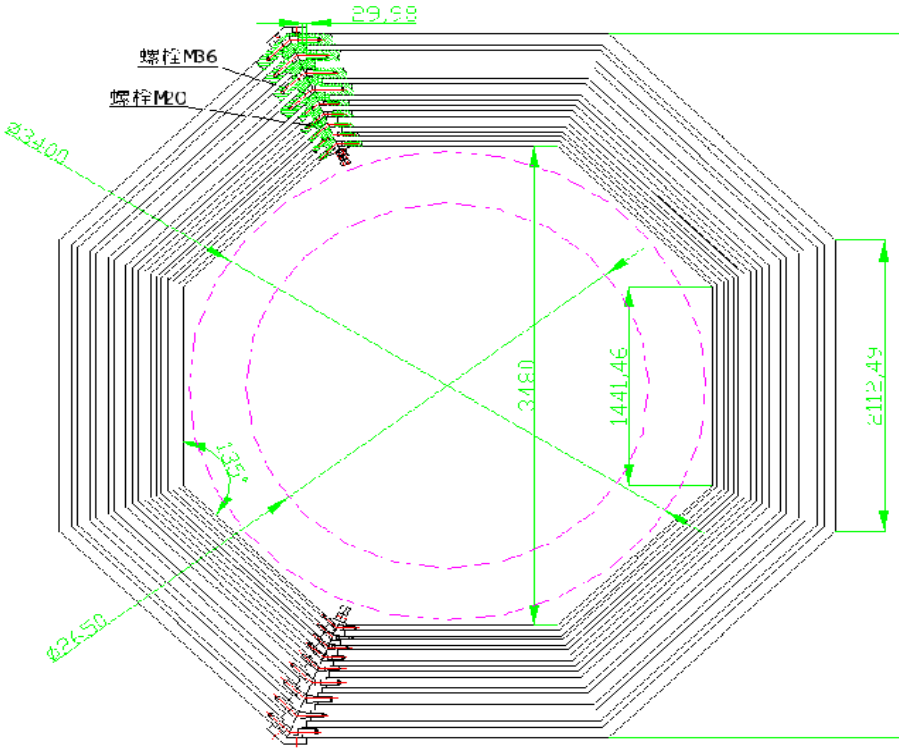


- PMT test completed at Tokyo University
- Preparation for installation completed
- Monitor system by Hawaii University completed

BESIII Status: μ system

- 9 layer RPC, 2000 m²
- Special bakelite plate w/o lineseed oil
- 4cm strips, 10000 channels
- Noise less than 0.1 Hz/cm²

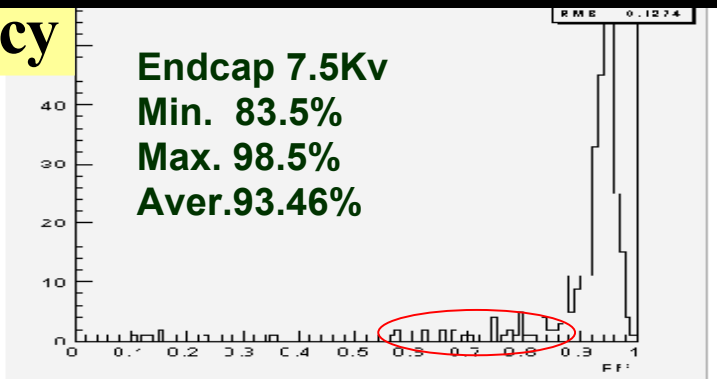




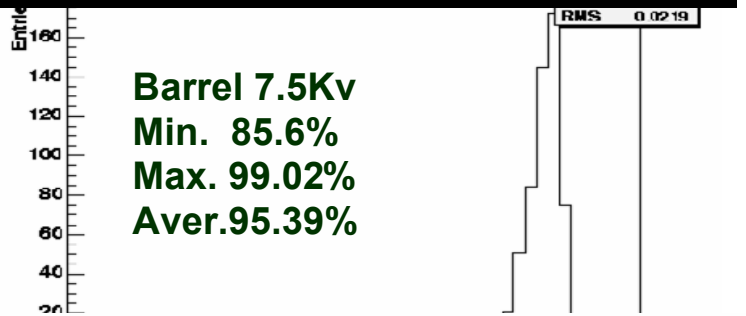
Mass production ---- Bare chamber test

Training time : 1 - 3days; endcap 320RPCs, barrel 590RPCs

efficiency

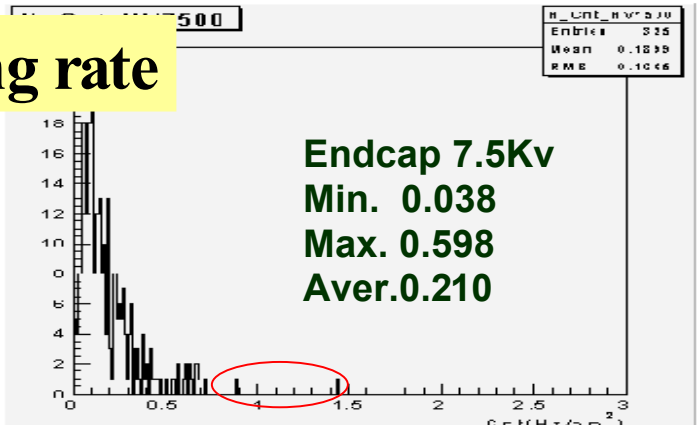


Endcap 7.5Kv
Min. 83.5%
Max. 98.5%
Aver.93.46%

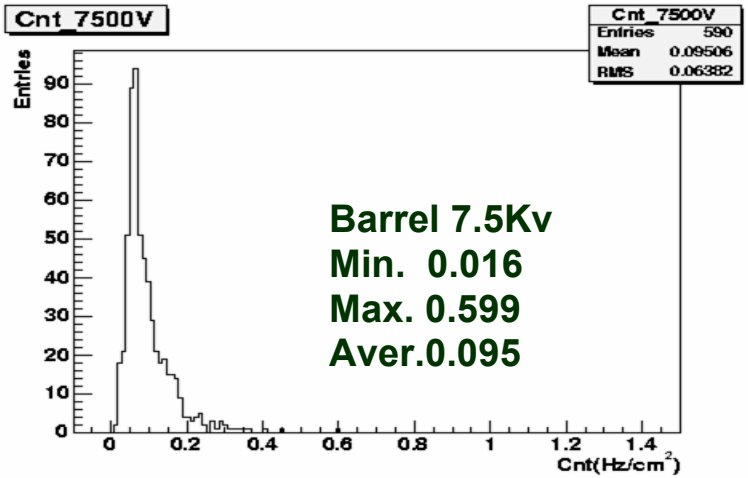


Barrel 7.5Kv
Min. 85.6%
Max. 99.02%
Aver.95.39%

counting rate

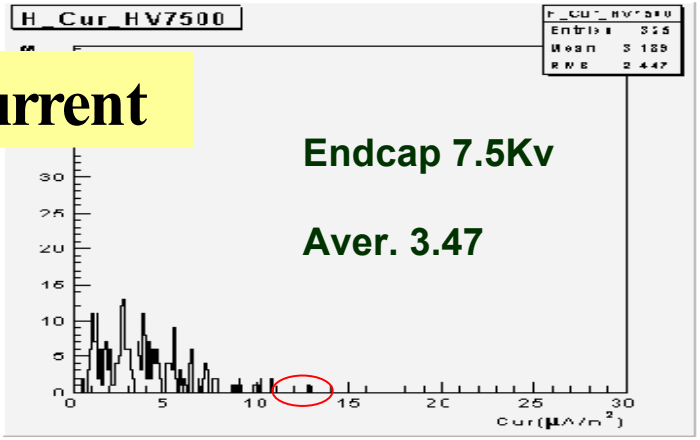


Endcap 7.5Kv
Min. 0.038
Max. 0.598
Aver.0.210



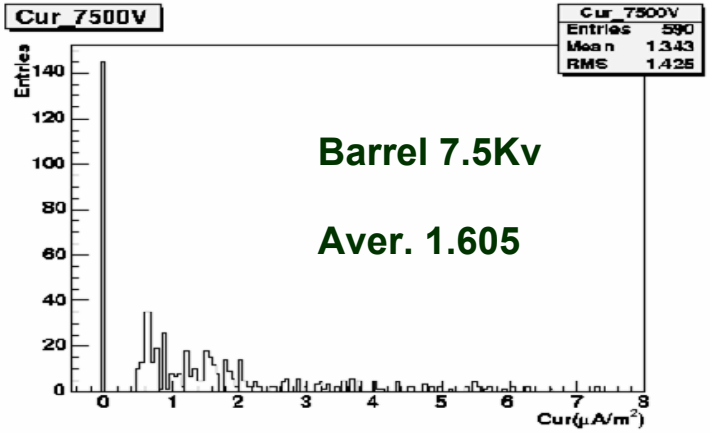
Barrel 7.5Kv
Min. 0.016
Max. 0.599
Aver.0.095

Dark current



Endcap 7.5Kv

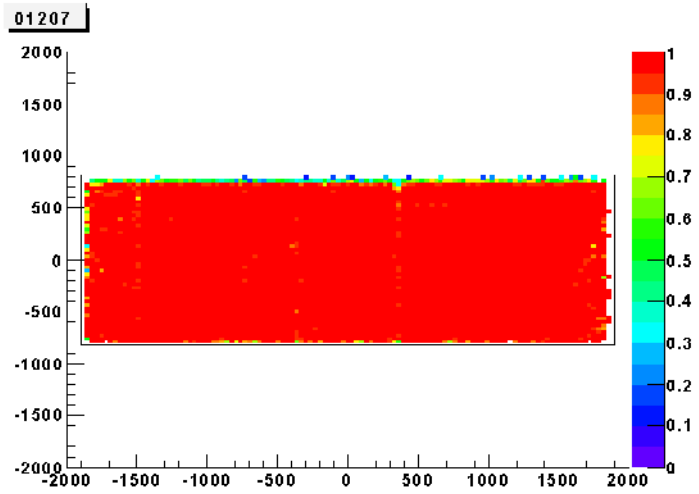
Aver. 3.47

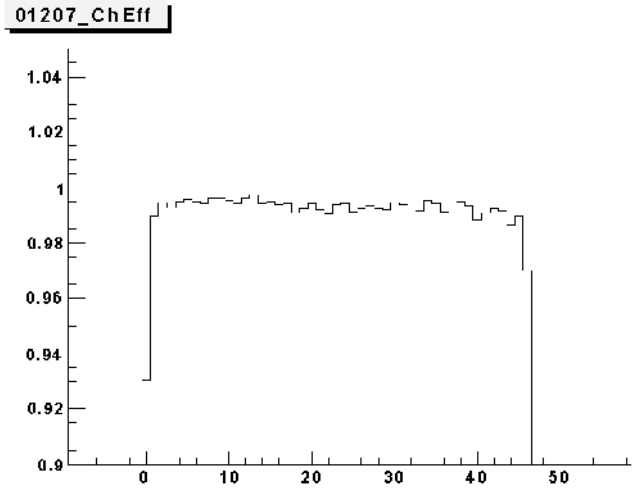


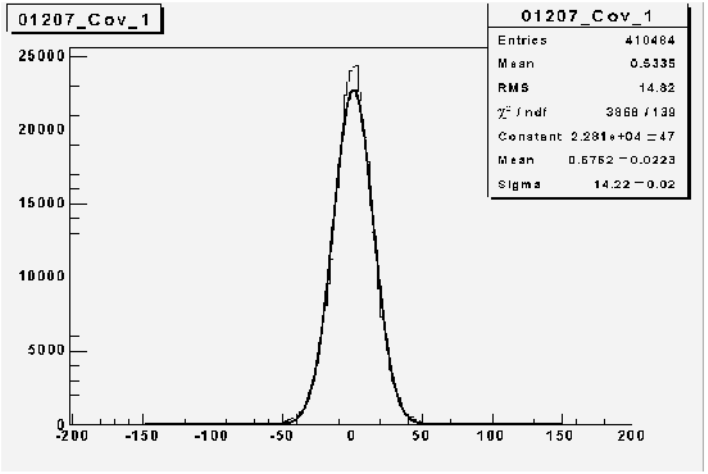
Barrel 7.5Kv

Aver. 1.605

Test results after installation

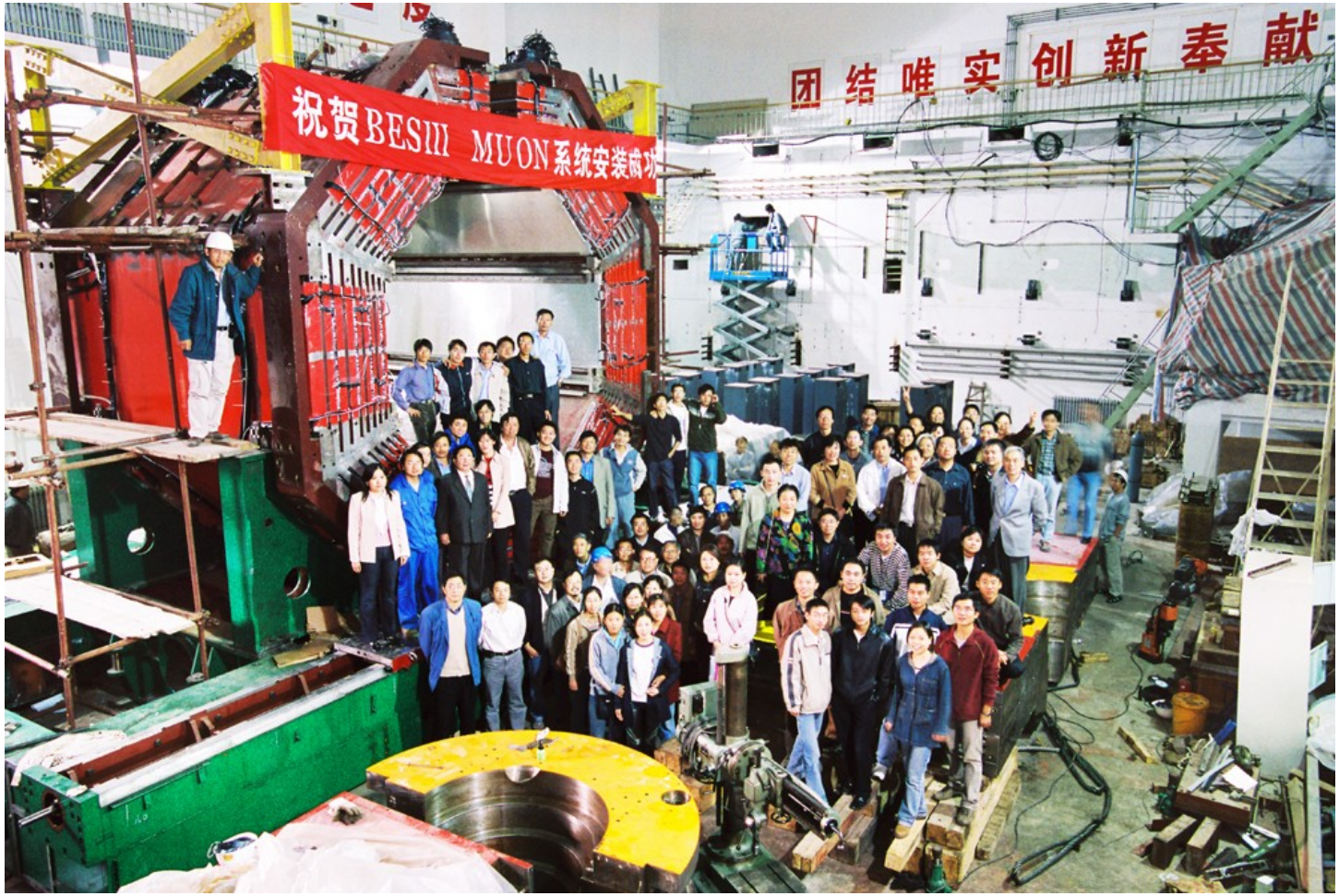






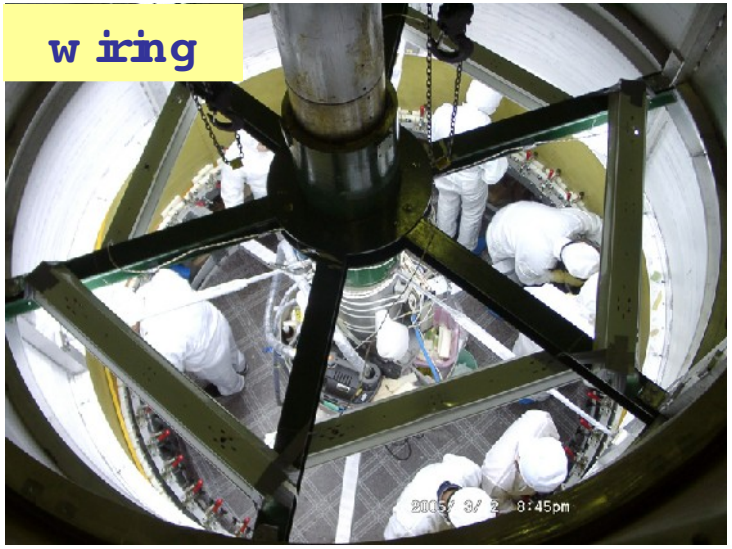
Module size: 3800mm*1640mm
Strip length: 3800mm
Strip width: 33mm
Average strip efficiency: 0.99
Spatial resolution: 14.2mm

Muon chamber installation completed



BESIII Status: Super-conducting magnet 1T@3400 A

wiring



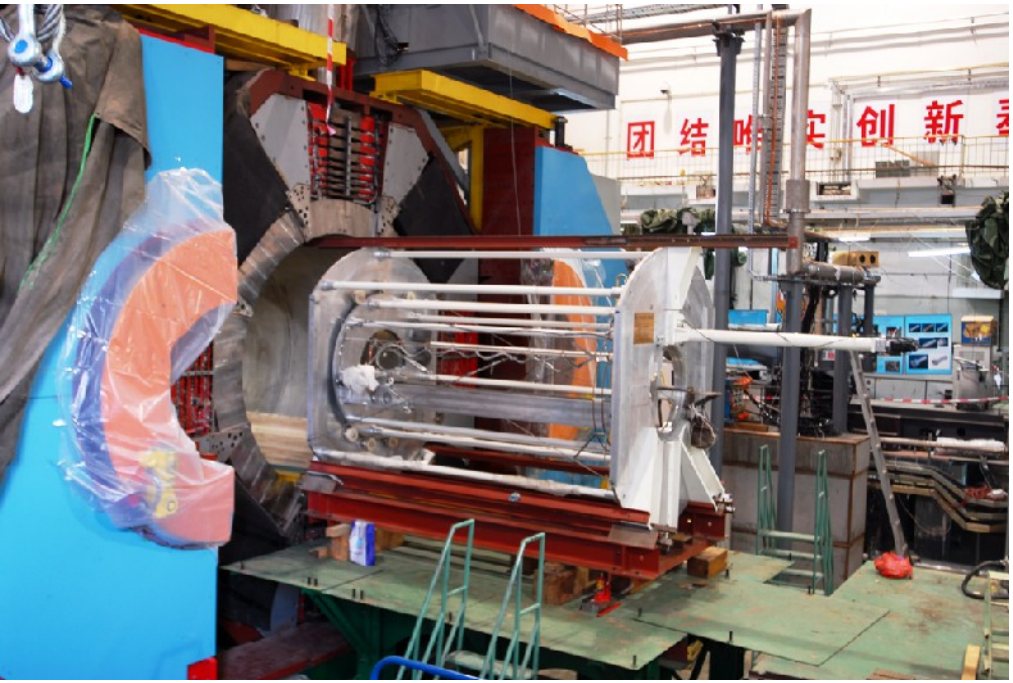
Thermal insulation

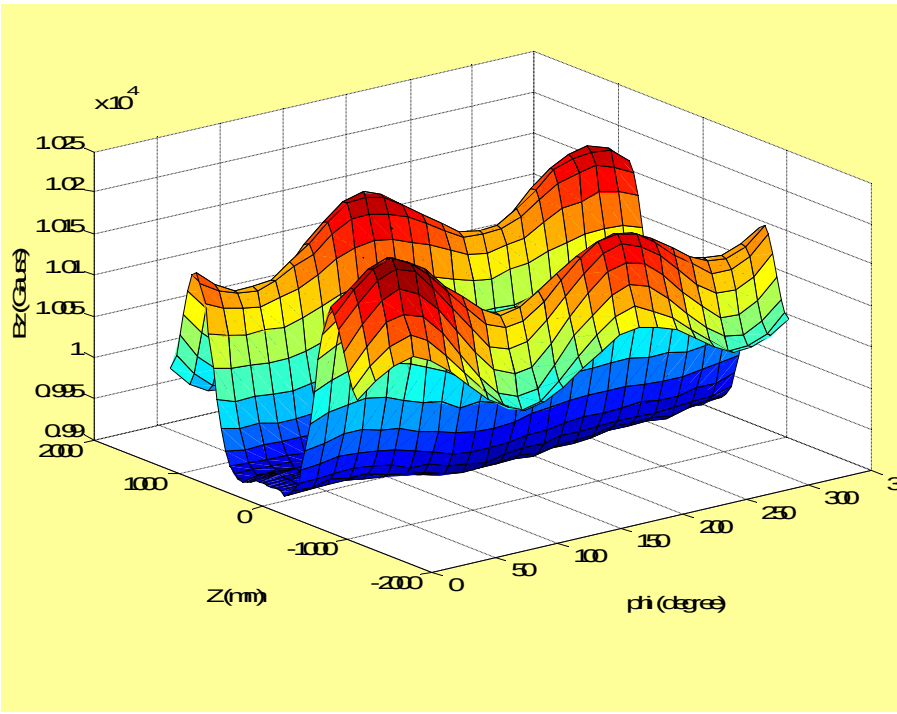
assembly

transportation

installation

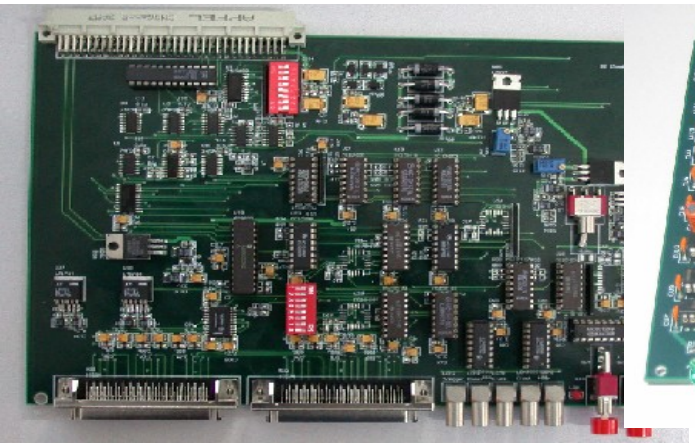
The magnet reached super-conducting status and 1T magnetic field at 3364A. Field mapping with SCQ completed at Aug. 07

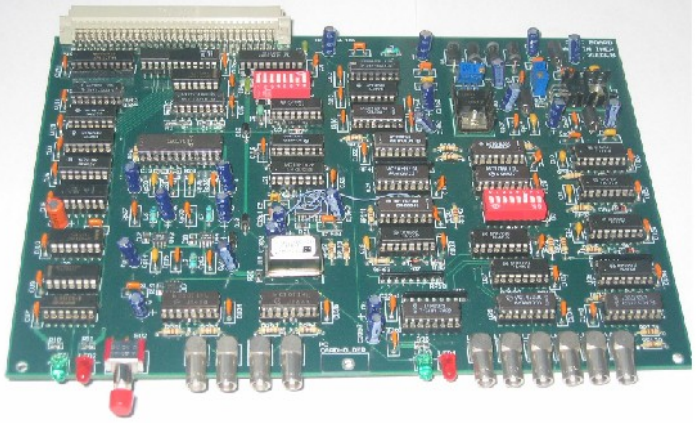




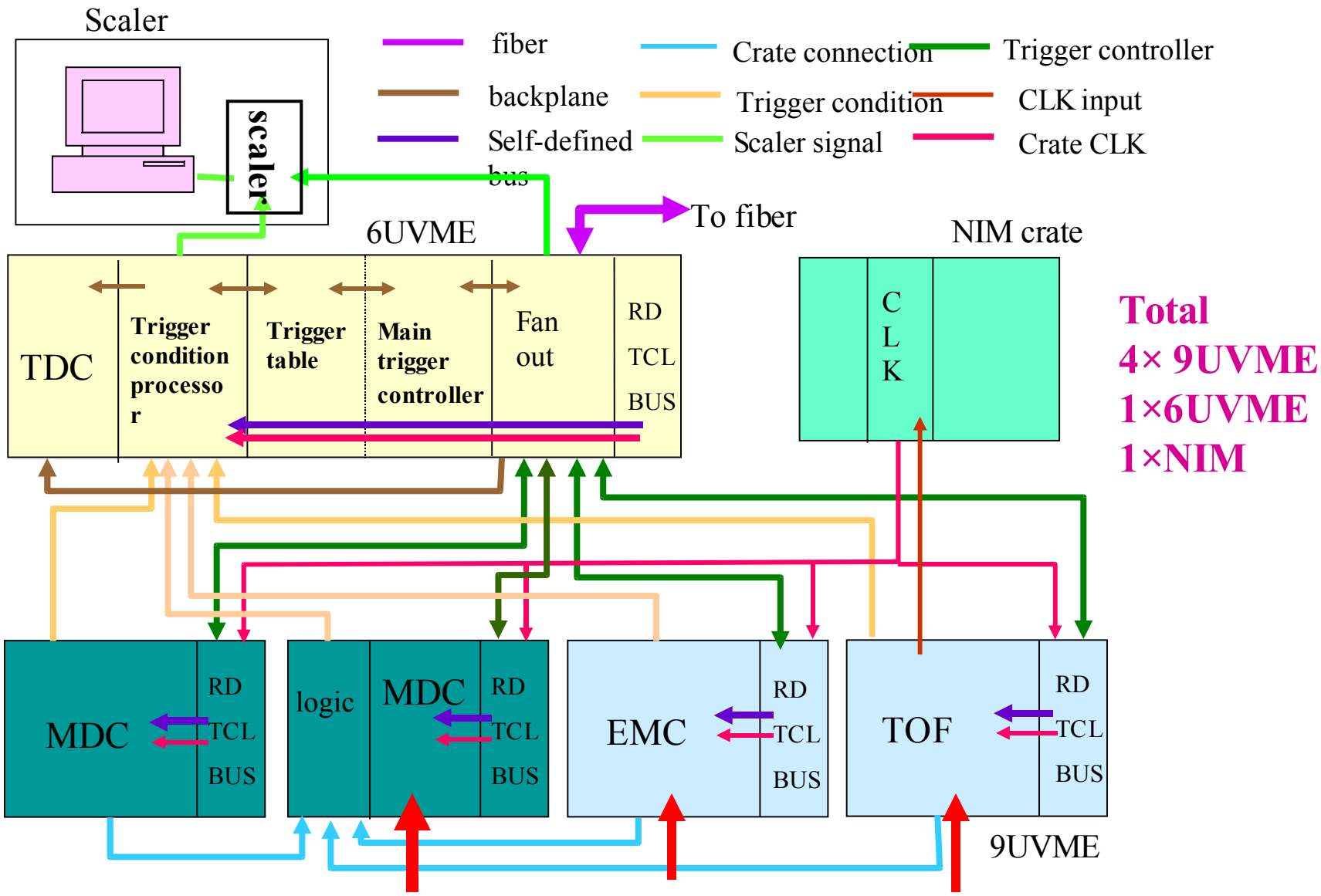
BESIII Status: Electronics

- Drift chamber 6500ch s_t ~ 500ps, s_q ~ 5 fc, 10bit ADC
- calorimeter: 6300ch, s_q ~ 0.5fc, 3×10bit ADC, noise < 1000ENC
- TOF 500ch s_t ~ 20 ps, 10bit ADC
- RPC 10000ch bit map
- Prototype and beam test all meet the design spec.
- Mass production completed
- Some tested with full trigger/DAQ system

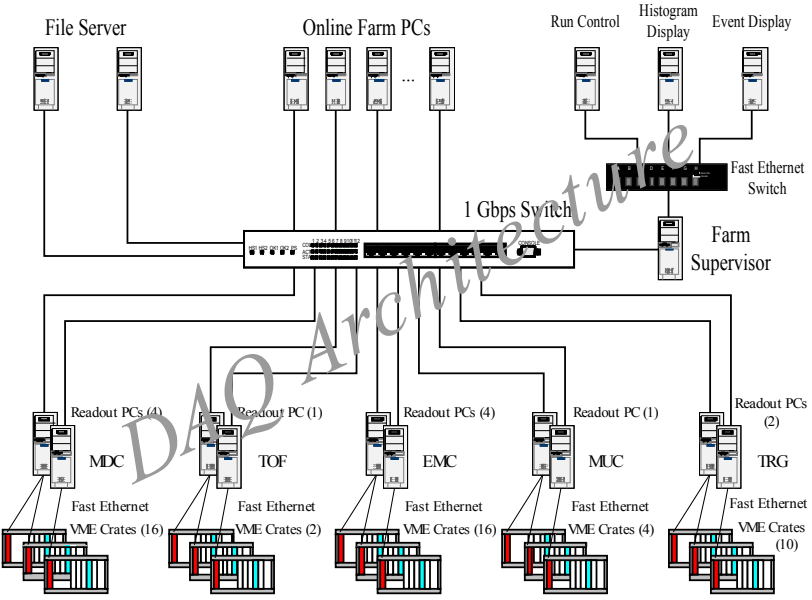


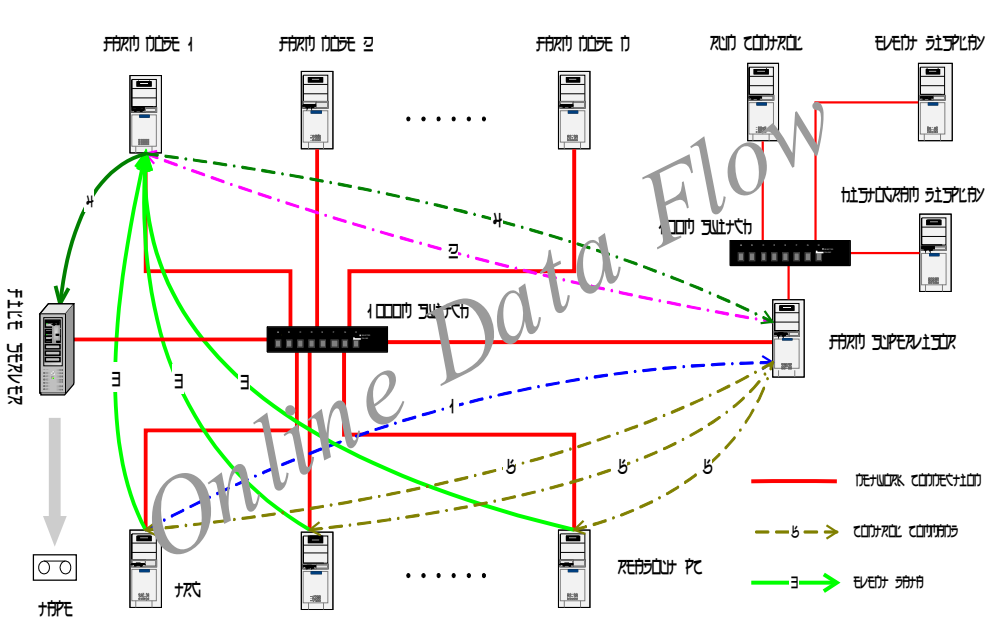


Trigger system hardware structure



BESIII Status: DAQ & online software

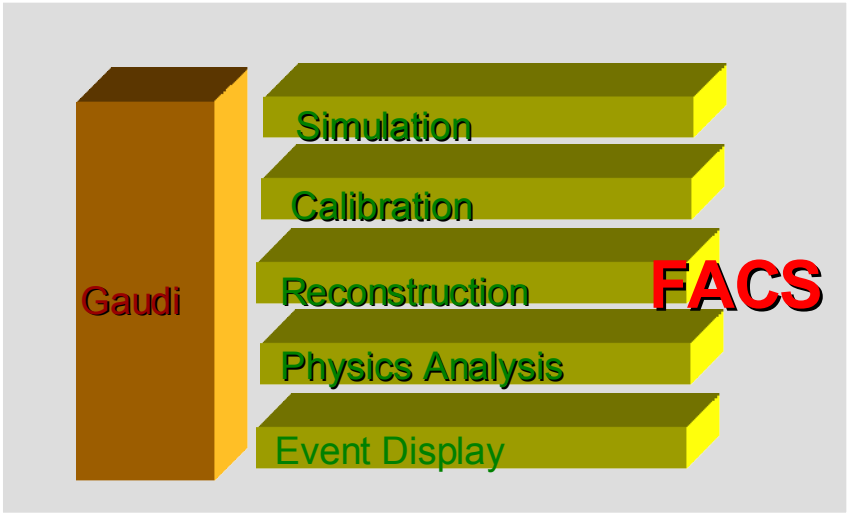


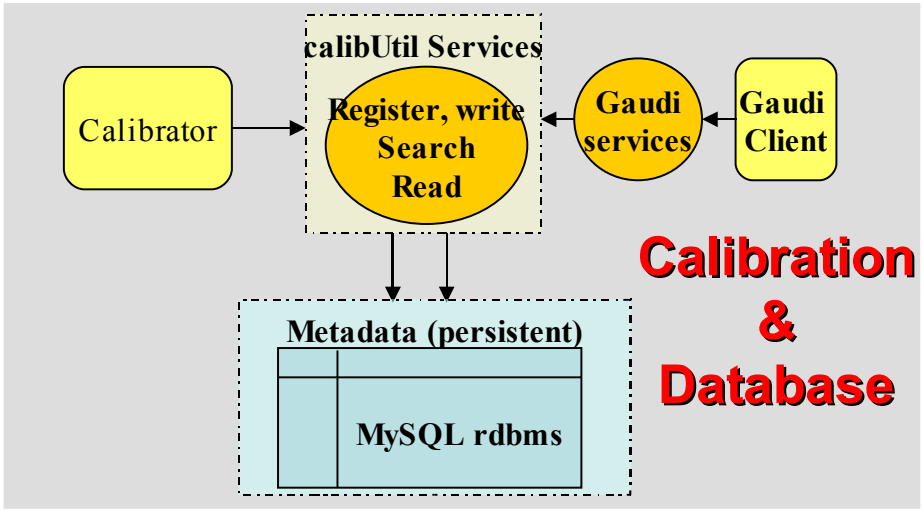


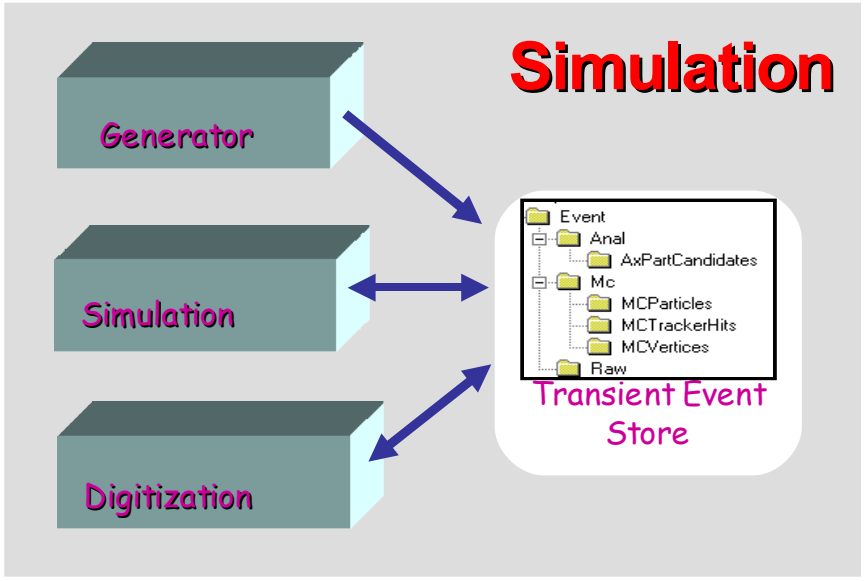
Key technical issued solved(speed, network, CPU, etc…)

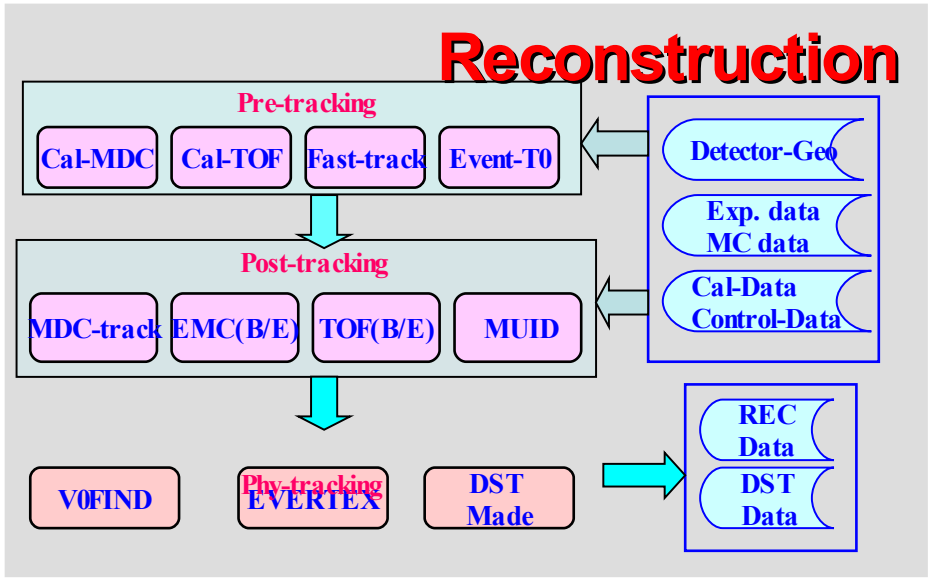
specification ~ 50Mb/s, 4000 Hz,
10 ×B-factory, 1000 × BESII

BESIII Status: Offline software system



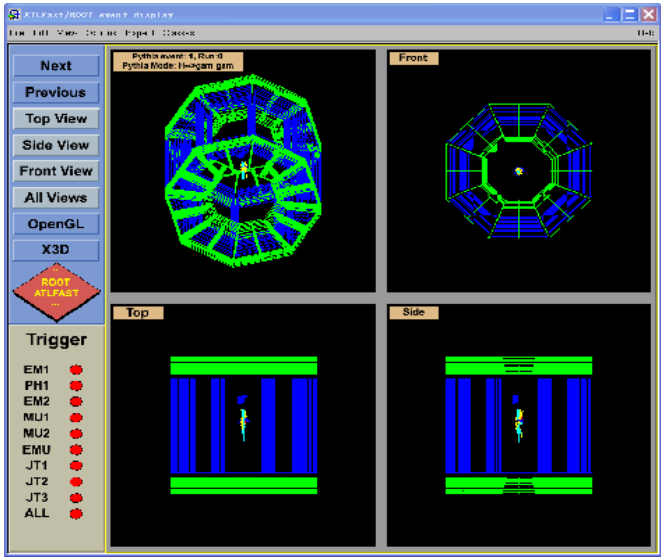


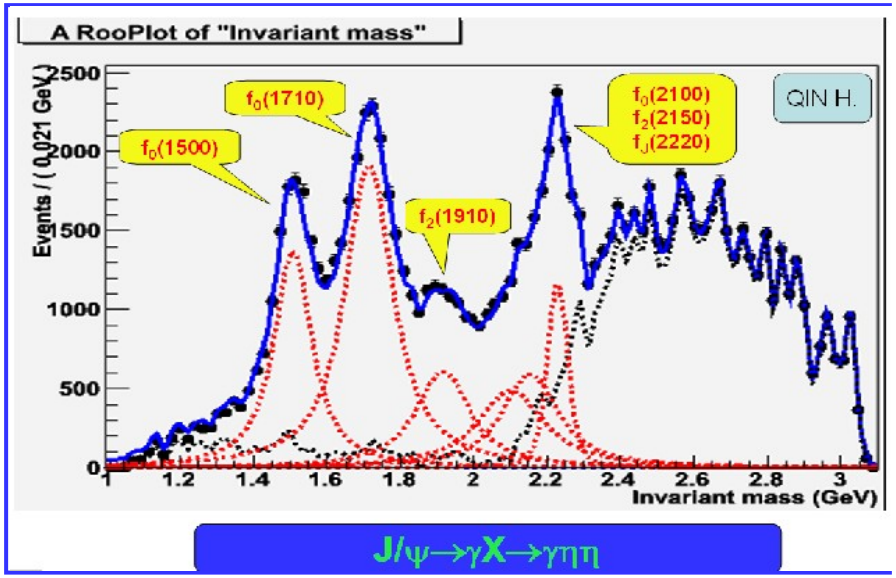




Monte Carlo simulation

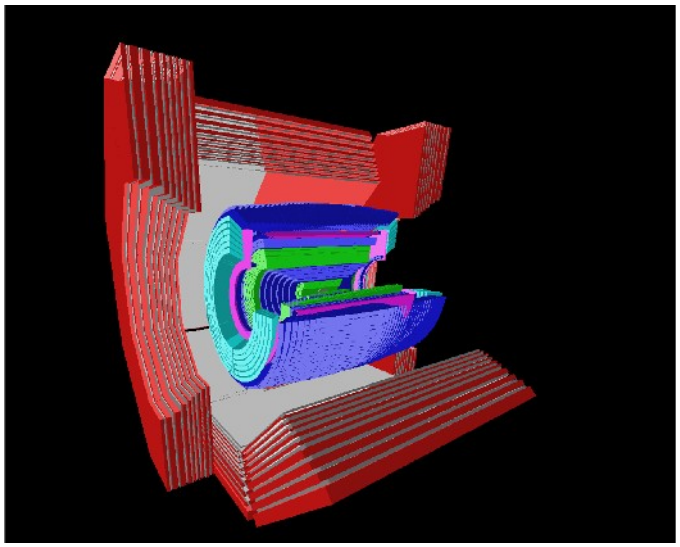
- GEANT4 based simulation framework completed
- Geometry, material and detector response completed
- Real detector response including 3D magnetic field, noise, trigger, bunch size etc completed
- All tested by reconstructed physics events
- Many generators, some are new for tau-charm physics
- Stable operation, large data sample generated

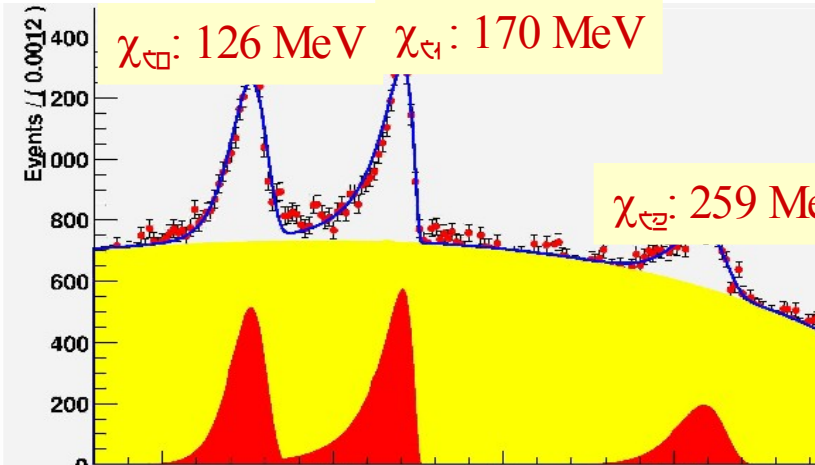




Event reconstruction and calibration

- Gaudi based framework completed
- Sub-detector reconstruction and calibration almost completed:
  - Kalman-filter based track fitting
  - Basic calibration algorithm established
  - No-bias Event reconstruction
  - Resolution in agreement with specification
  - Timing zero can be reconstructed
  - Secondary vertex can be reconstructed
  - Online event filter
  - Stable operation for physics studies





Inclusive γ spectrum in ψ(2S)

BESIII Status: Schedule

- 2/2003: Official approva
- 7/2004: BESII detector
- 5/2005: Magnet yoke &
- 9/2006: Super-conducti
- 8/2007: Magnetic field
- 10/2007: EMC installati
- 10/2007: MDC/TOF ins
- 1/2008: Cosmic-ray test
- 3/2008: BESIII detector
- Summer 2008: Start da

: Yifang Wang [yfwang@ihep.ac.cn]
: 2007 11 5 18:48
: BES3_member@ihep.ac.cn
: celebrate the successful installation of the MDC

Dear friends,

I am pleased to announce that our MDC has been successfully installed into the BESIII detector. To celebrate this great event which marks the most important milestone of the BESIII detector construction, please come to join us for a drink tomorrow at 11: 30 am (Tuesday Nov. 6 Beijing time) in the BESIII experimental hall.

See you there.

Yifang

Summary

- BEPC/BES has been, until most recently, a unique facility running at tau-charm region since 1989.
- Many interesting results produced.
- BEPCII/BESIII construction is close to the completion
- Summer 2008 will be exciting in Beijing, hopefully not only for Olympic games.
- Welcome new collaborators

Thanks to

FCPPL & EGIDE for the support

LAL for its hospitality

and

YOU ALL !