New BESIII Initiative Meeting
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OUTLINE

• Introduction: physics of tau charm region.
• History
• BESI/II Collaboration
• BESIII Collaboration
• Summary
The Beijing Electron Positron Collider (BEPC)

BESII

CM Energy ranges from 2 to 5 GeV
Luminosity at J/ψ ~ 5 x 10^{30} cm^{-2} s^{-1}

A unique e^+e^- machine in the τ-charm energy region since 1989 – until CLEOc.
Physics of tau – charm region

Tremendous variety: taus at threshold, R, charm, charmonium, transition region between perturbative and non-perturbative QCD, etc.

Many new particles: X, Y, Z, etc. Hybrids? Glueballs?

\[ \psi(3770) \text{ charm threshold} \]
Tau mass measurement

- BESI measurement:

\[ m_\tau = 1776.96^{+0.18 +0.25}_{-0.21 -0.17} \text{ MeV/c}^2 \]

79 citations

- 10X better precision
BESI -- Tau mass measurement

- Lifetime, leptonic branching ratio, and mass: $\Gamma \sim (m_\tau)^5$.

Status 1992 (2.4 $\sigma$) and 1994 (1.3 $\sigma$)

Status 2006
A. Pich, Charm06 talk
R Below 10 GeV

BES reduces R errors from 15 - 20 % to an average of 6% in the 2 - 5 GeV region. Important region!

PRL 84, 594
PRL 88, 101802
67 + 137 citations
R measurement

- Needed to improve precision of $\alpha(M^2_Z)$:
  - Uncertainties in $\alpha$ introduced when it is extrapolated to the $Z$-pole:
    \[ \alpha(q^2) = \frac{\alpha_0}{1 - \Delta\alpha(q^2)} \]
    \[ \Delta\alpha(q^2) = \Delta\alpha_L(q^2) + \Delta_{had}^{(5)}\alpha(q^2) + \Delta_{top}\alpha(q^2) \]
  - Dominant uncertainty due to hadronic vacuum polarization.
  - This is determined from $R$ values using a dispersion relation.

\[ \Delta\alpha_{had}(s) = -\frac{\alpha}{3\pi} s \int_4^{s'}^\infty \frac{R_{had}(s')}{s'(s' - s)} ds' \]

- The Higgs mass determined from radiative corrections in the SM is very sensitive to $\alpha(M^2_Z)$. 
Data from tau-charm mass region important for standard model fits.

$m_H = 62^{+53}_{-30} \, GeV$  
$m_H < 170 \, GeV$  
(95% C.L.)

$m_H = 98^{+58}_{-38} \, GeV$  
$m_H < 212 \, GeV$  
(95% C.L.)

History

1979  First US/PRC HEP meeting
1984  BEPC approved
1988  first electron positron collisions
1991  US/China BESI Collaboration formed
1992  tau mass measurement published
1993  Hawaii joins
1995/96 BESII Upgrade
1998/99 R Scan (91 energy points)
2000/01 J/psi data (58 M)
2002  psi' data (14M)
2003  BEPCII/BESIII approved
2006  BESIII collaboration formed

1/29/2008
US Groups and Contributions
BESI and BESII

Boston University
Caltech
UC Irvine
Colorado State University
University of Hawaii
MIT
SLAC
University of Texas at Dallas
University of Washington

Hardware Contributions
MDCII endplates & feed throughs
TOF Calibration System
Vertex Chamber (MarkIII)
Preamps for VC
Luminosity Monitor
MDCIII, Outer Cylinder, & preamps

Other
Physics analyses
Refereeing
Students
Publication policy
Polishing papers
BESIII Collaboration

Institute of High Energy Physics
University of Science and Technology
Peking University
Tsinghua University
Shangdong University
Nankai University
Central China Normal University
University of Anhui
University of Zhejiang
University of Zhengzhou
Nanjing Normal University
Nanjing University
Shanxi University
Sichuan University
Henan Normal University

University of Hawaii
University of Washington
University of Tokyo
Joint Institute of Nuclear Research, Dubna
GSI
University of Bochum
University of Giessen

Need more here!
BESIII Collaboration
Organization progressing nicely:

- Governance rules adopted at Jan. 2006 meeting.
  - IB constituted and IB Chair elected.
  - Spokespersons elected.
  - IB committees established.
- Management Plan adopted at June 2006 meeting.
- Analysis Infrastructure - decided at Jan. 2007 meeting.
  - Input from CLEOc groups important.

Organized like any other international collaboration.

1/29/2008
BESIII Overall Structure

Collaboration Meeting (votes on important matters)

Institutional Board (organizational issues, admission of new institutions, author list, etc.)

Executive Board (advisory - scientific, technical, and management.)

Spokespersons (Represent and run collaboration)

Management Team

Committees: Nominating, membership, etc.
Physics coordinators

- Appointment procedure
  - Nominated by spokespersons and ratified by EB
  - Term: 1 year as deputy coordinator and 1 year as coordinator

- Responsibilities
  - Organize physics analysis and physics tools groups, recommend their conveners to EB after consultation with the physics coordination committee (PCC).
  - Organize and chair analysis meetings, arrange parallel and plenary physics sessions at collaboration meetings.
  - Organize discussions on physics priorities, running plans, Monte Carlo production priorities, etc.
  - Allocate resources (computing, man power,...) for physics analysis
  - Organize efforts, in coordination with the software coordinator, for data quality checks, performance tests, calibration verification, ...
  - Organize efforts to provide common analysis tools, methods, standards, and data (such as luminosities, bad runs, ...)
  - Responsible for high quality and efficient publication of physics papers, including tracking analysis progress, appointing paper referees, ...
**BESIII TOF Monitoring System**

- Monitor the amplitude and time performance of each channel including PMTs and electronics.
- Being built by University of Hawaii (F. Harris, S. Olsen, G. Varner, M. Rosen, Lucas Nguyen):
  - Use mirror to steer beam - like BESII.
  - Purchase fiber cable bundles (2 cables).

![Diagram of TOF Monitoring System]

- Laser
- Light splitter
- Electronic switch
- Fiber bundles
- Ref. PMT
- TDC start
- ADC gate
- Connector
- Fiber
- PMT
- TOF barrel
- TOF endcap 48 fibers
- TOF barrel 176 fibers
Fiber Bundle Cables (need 2)

1) Cylindrical ferrule, suitable for clamping to, with strain relief.
2) If bundle feeds into break-out box, then it needs a mechanical termination suitable for sheet metal.
3) Customer will design panel or box, upon acceptance of fiber design.
4) Space constraints require that 32 fibers are able to terminate onto a (customer designed) panel 40mm x 80mm.
Summary

• BES has had a long productive history.
• US participation has been extremely important but needs to be strengthened for BESIII.
• BESIII Collaboration formed, much of the governance structure decided.
• Analysis structure details remain.
• Commissioning expected in late 2007.
• Rich physics after CLEOc. 10 billion J/ψ events per year.
• New US groups should join now to have impact on software, computing, physics analysis, and upgrades.