Experimental Program for Super Tau-Charm Facility

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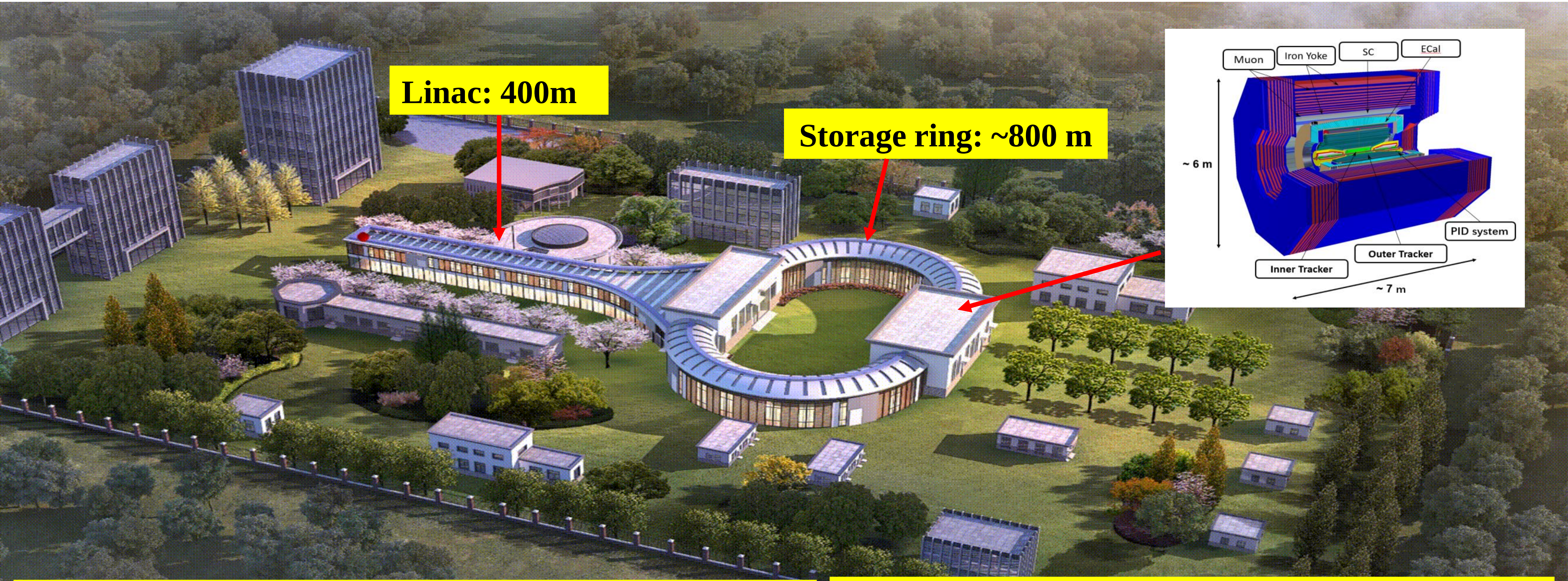
Windows on the Universe – 30th Anniversary of the Rencontres du Vietnam

8.6-8.13, 2023, Quy Nhon

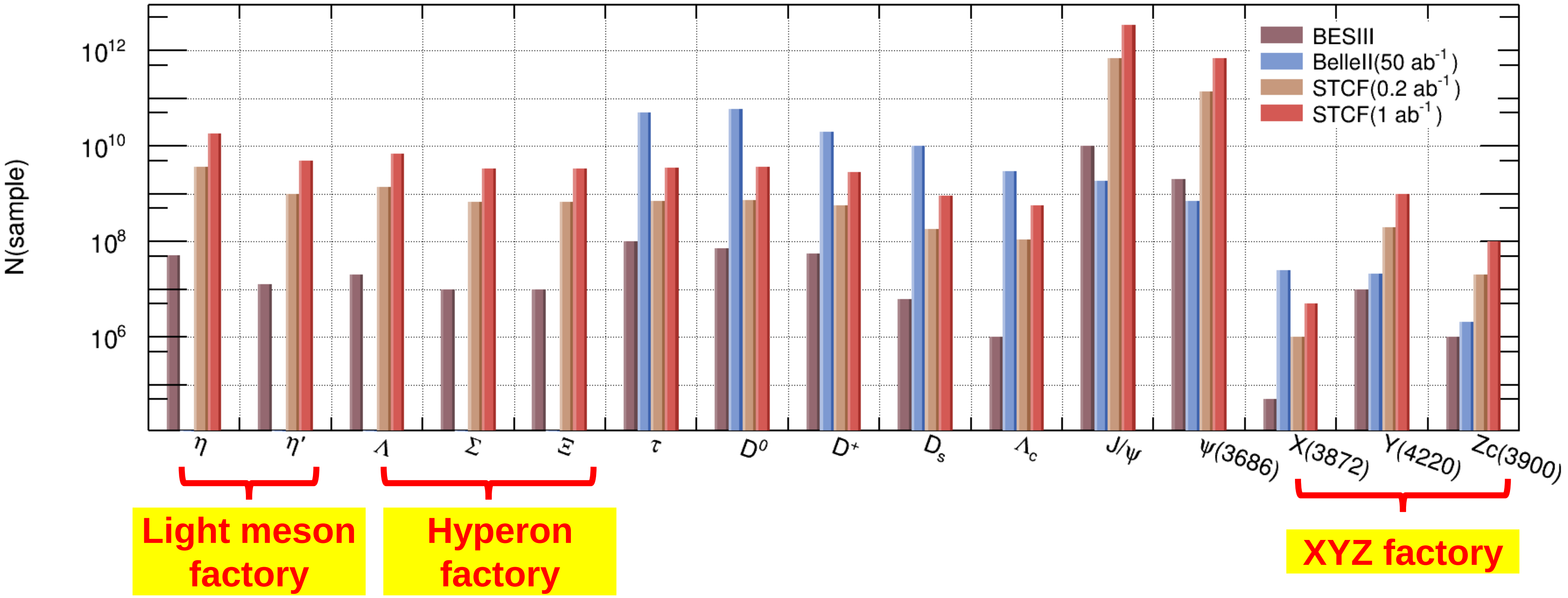
Super tau-charm facility in China



- Peak luminosity $>0.5\times10^{35}$ $cm^{-2}s^{-1}$ at 4 GeV
- Energy range E_{cm} = 2-7 GeV
- Potential to increase luminosity & realize beam polarization
- Total cost: 4.5B RMB

- 1 ab^{-1} data expected per year
- Rich of physics program, unique for physics with *c* quark and τ leptons,
- Important playground for study of QCD, exotic hadrons, flavor physics and search for new physics.

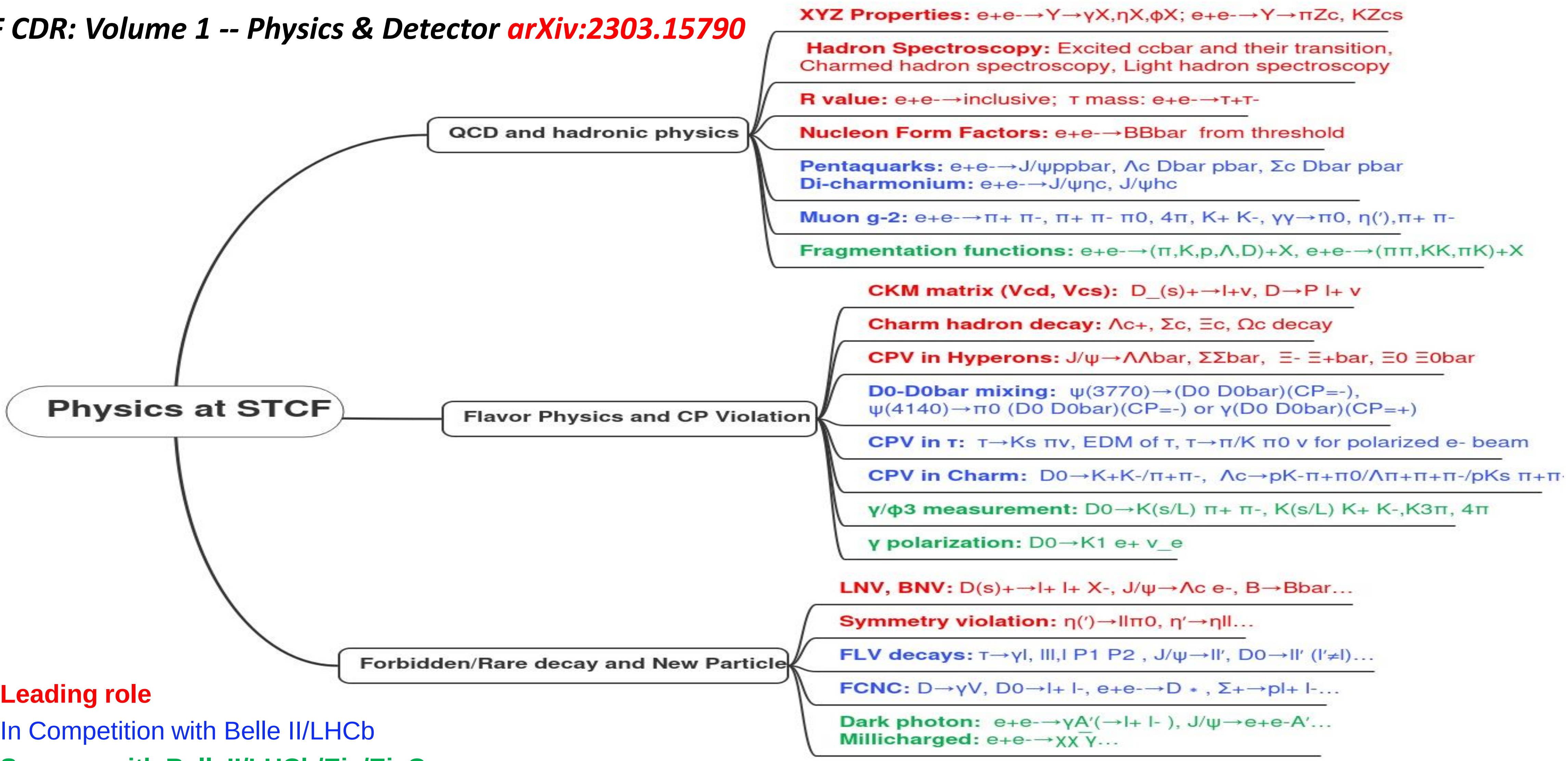
Expected data samples at STCF



- STCF is expected to have higher detection efficiency and low bkg. for productions at threshold
- STCF has excellent resolution, kinematic constraining
- Opportunities at 5-7 GeV which is experimentally blank before

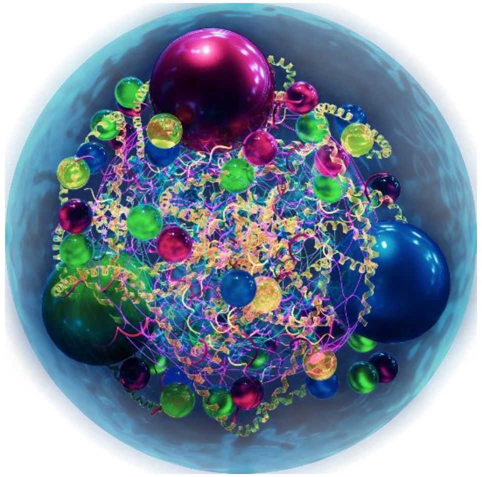
Physics program of STCF

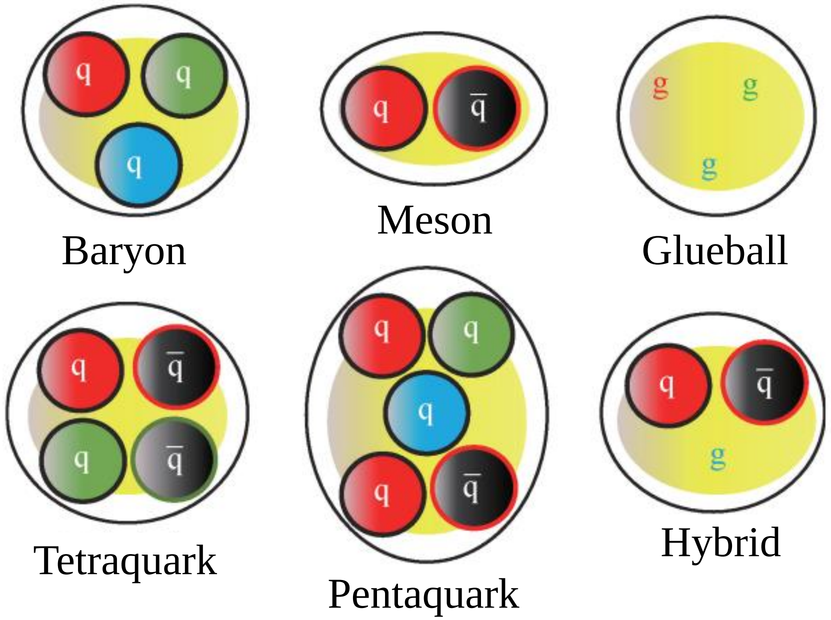
STCF CDR: Volume 1 -- Physics & Detector *arXiv:2303.15790*



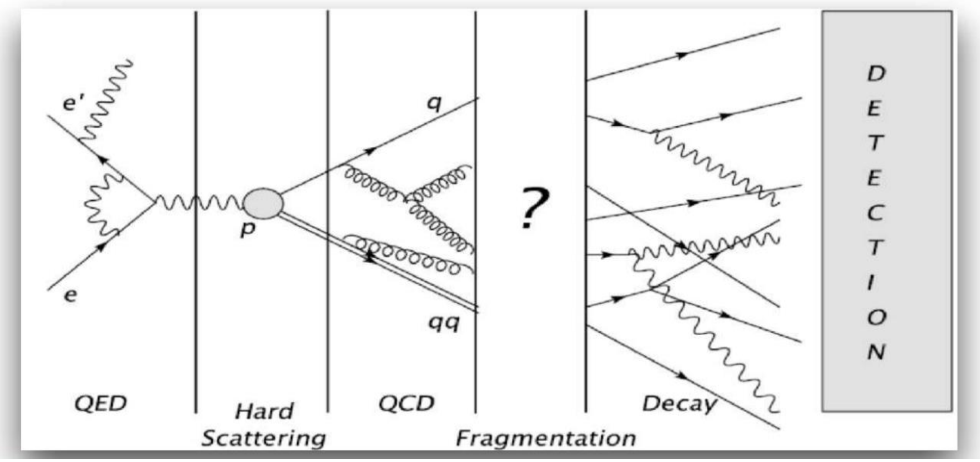
- Leading role
- In Competition with Belle II/LHCb
- Synergy with BelleII/LHCb/Eic/EicC

Hadron structure and hadron spectroscopy



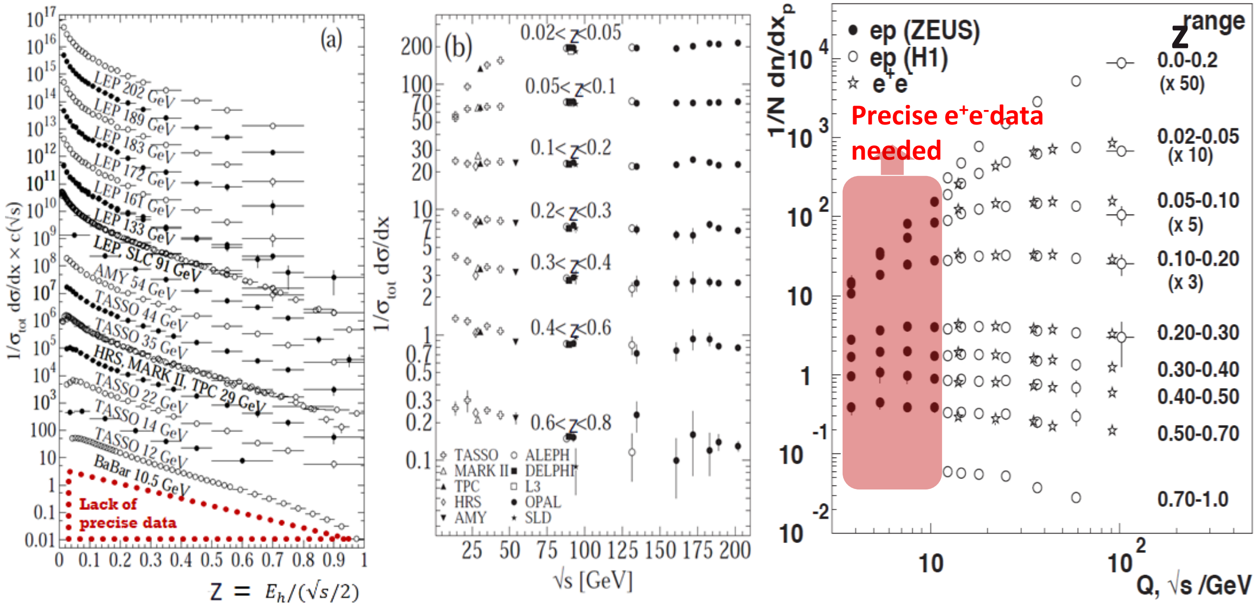


Fragmentation functions

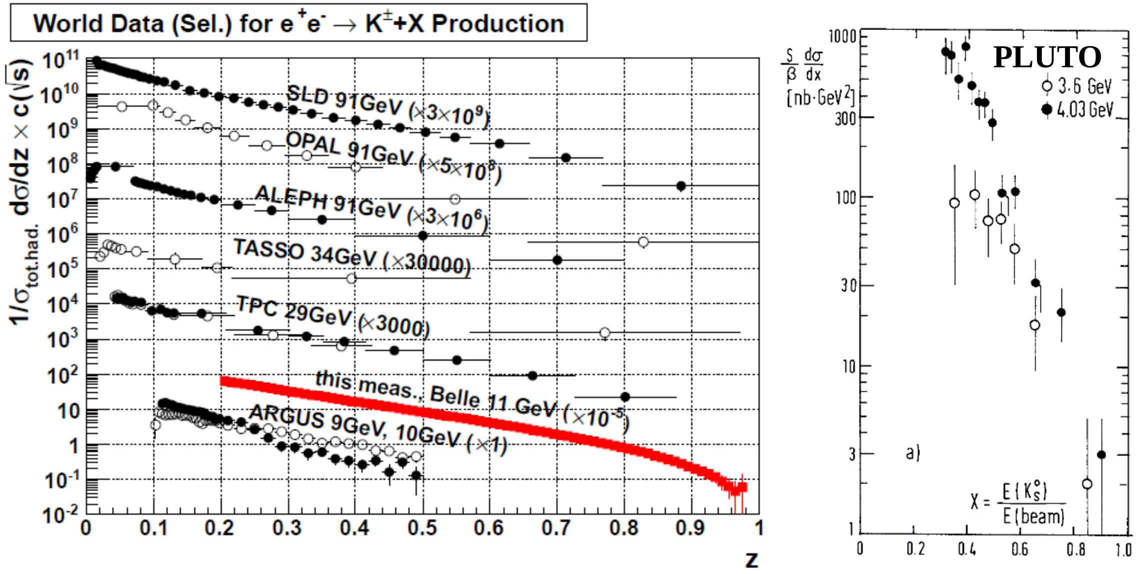


Fragmentation function $D_q^h(z)$: probability that hadron *h* is found in the debris of a hadron carrying a fraction $z=2E_h/\sqrt{s}$ of parton's momentum.

World data: Pion



World data: Kaon



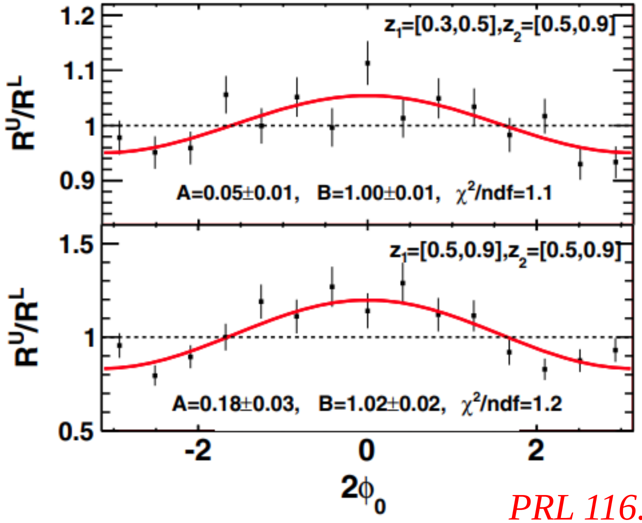
Collins fragmentation function

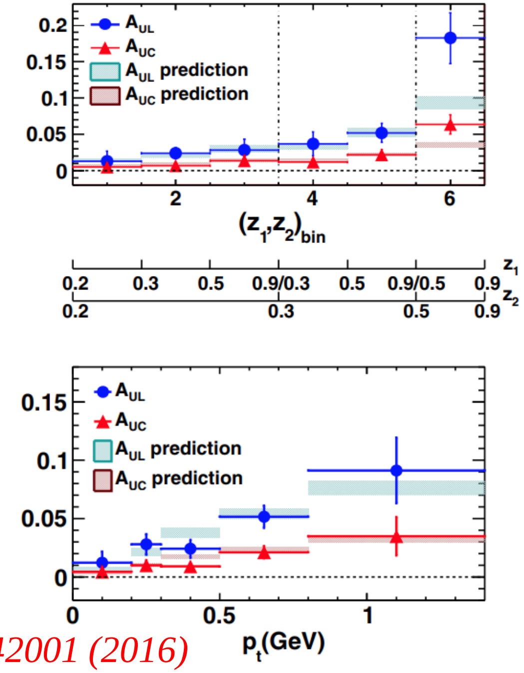
Collins FF

→ describes the fragmentation of a transversely polarized quark into a spin-less hadron *h*.

→ leads to an azimuthal modulation of hadrons around the quark momentum, that can be extract by the double ratio

$$\frac{R^U}{R^{L(C)}} = A\cos(2\phi_0) + B$$



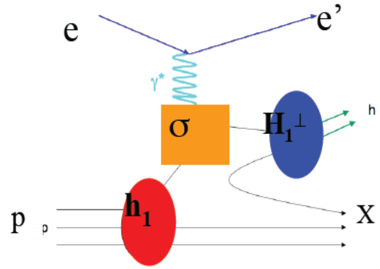


PRL 116.042001 (2016)

Significant Collins asymmetries are observed rise with fractional energies and p_t

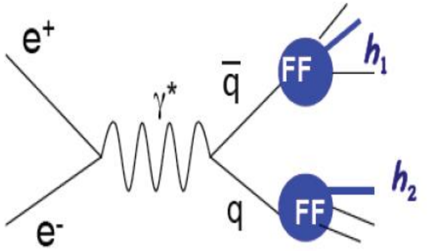
SIDIS

Transversity ⊗ Collins FF



e+ e-

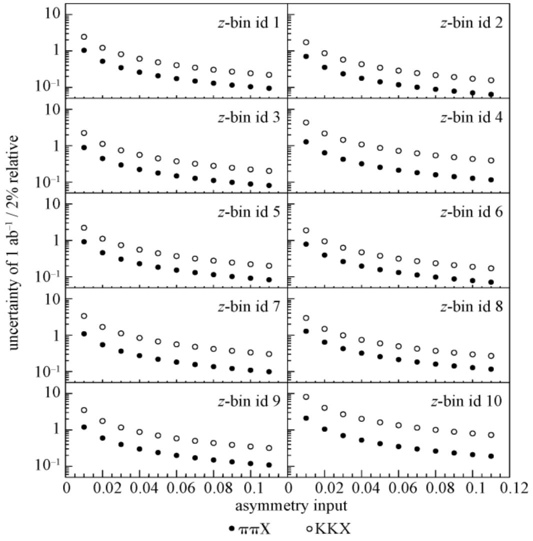
Collins FF ⊗ Collins FF



The statistical uncertainty asymmetry A^{UL} with $1ab^{-1}$ at 7 GeV:

$(1.4\sim4.2)\times 10^{-4}$ for $\pi\pi X$

$(3.5\sim20)\times 10^{-3}$ for KKX



The result will provide precision Collins FF input for TMD extraction by EicC (a precision of 2% is required).

Journal of UCAS 38 (2021) 433

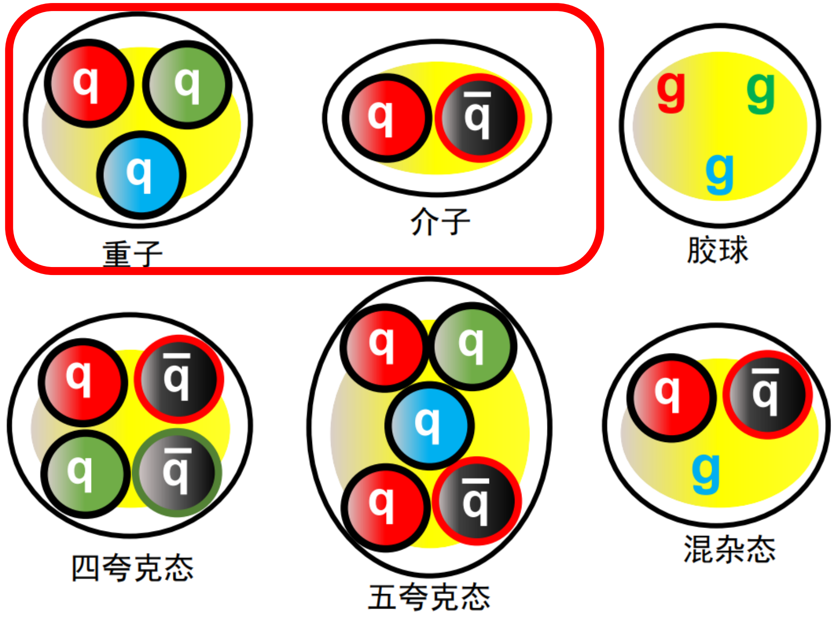
Hadrons Spectrum

- Experiments at particle accelerators in last fifties and sixties created more than 100 hadrons ➔ "hadronic zoo"
- Quark model established order in the hadronic zoo

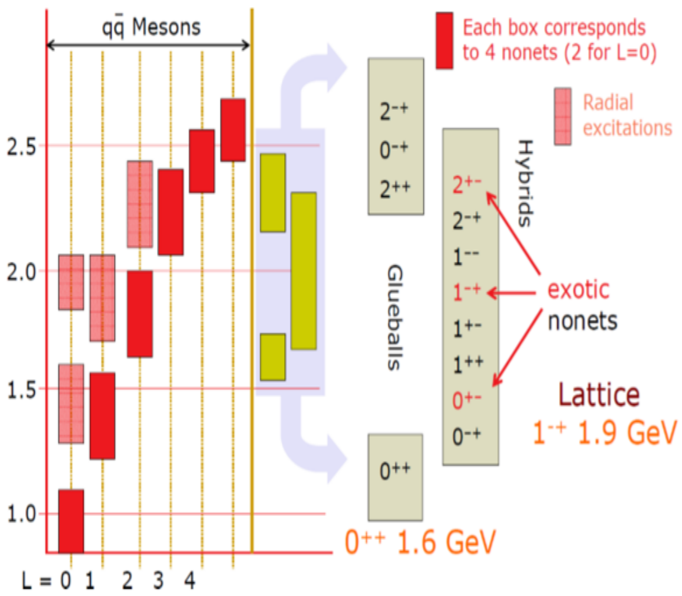
M. Gell-Mann, A schematic model of baryons and mesons: Phys.Lett. 8 (1964) 214-215
"Baryons can now be constructed from quarks by using the combinations (qqq), $(qqqq\bar{q})$, etc., while mesons are made out of $(q\bar{q})$, $(qq\bar{q}\bar{q})$, etc".

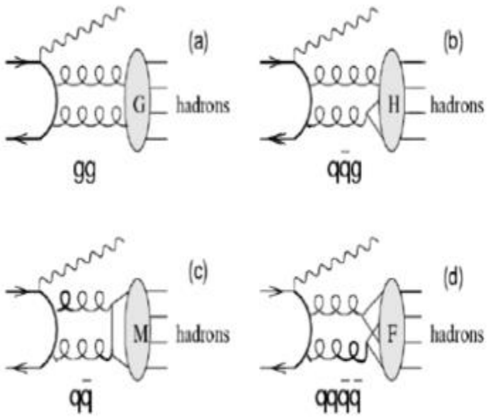
G. Zweig, An SU(3) model for strong interaction symmetry and its breaking. CERN-TH-401
"In general, we would expect that baryons are built not only from the product of these aces, AAA, but also from $\bar{A}AAAA$, $\bar{A}\bar{A}AAAAA$, etc., where $\bar{A}$ denotes an anti-ace. Similarly, mesons could be formed from $\bar{A}A$, $\bar{A}\bar{A}AA$, etc".

- Suggested by self-coupling of gluons of QCD, glueballs and hybrids exist.
- Experimental searches for exotic hadrons have a long history
- Recent high-quality data samples from several experiments allow us study the properties of established mesons, and search for new states.



Glueballs and hybrids



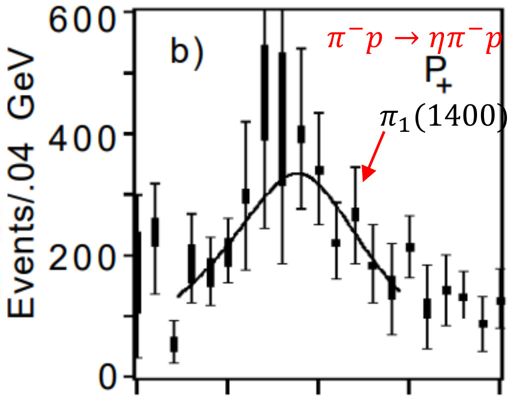


$\Gamma(J/\psi \to \gamma G) \sim O(\alpha\alpha_s^2), \Gamma(J/\psi \to \gamma H) \sim O(\alpha\alpha_s^3),$

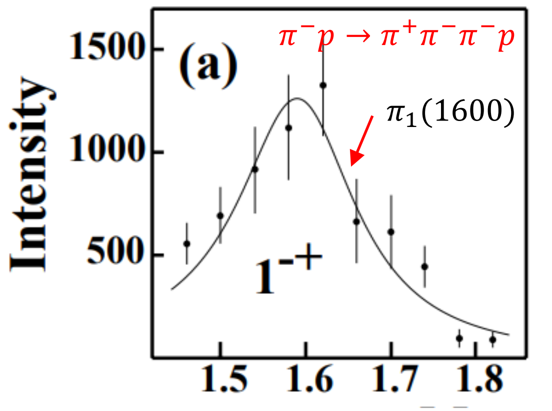
$\Gamma(J/\psi \to \gamma M) \sim O(\alpha\alpha_s^4), \Gamma(J/\psi \to \gamma F) \sim O(\alpha\alpha_s^4)$

- Experimental evidence for isovector/isoscalar states with $J^{PC} = 1^{-+}$, complete the hybrid multiplet.

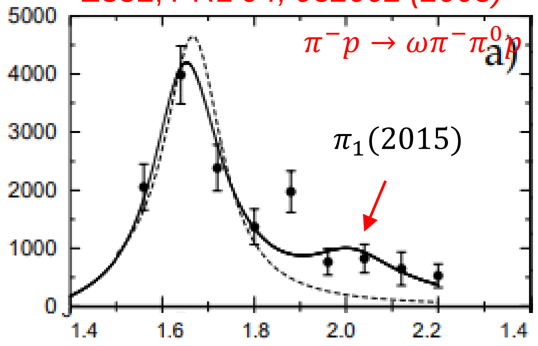
E852, *PRL* 79, 1630 (1997)



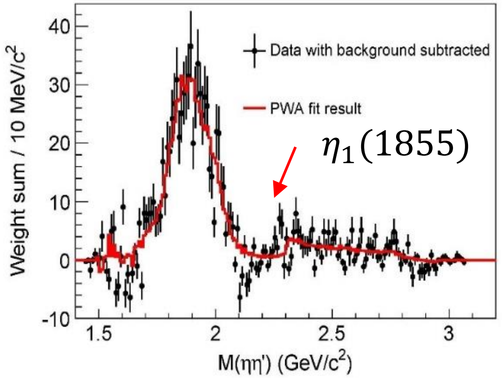
E852, *PRL 81, 5760 (1998)*



E852, *PRL 94, 032002 (2005)*



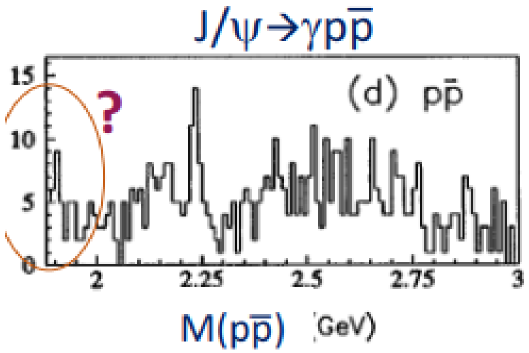
PRL 129 (2022) 192002



- Charmonium decays are ideal hunting grounds for light glueballs and exotics
  - "Glue-rich" environment
  - Clean high statistics data samples from e^+e^- production

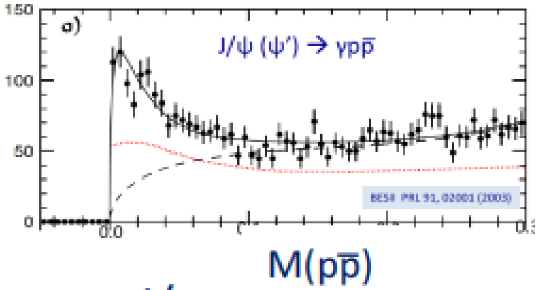
States in $\eta'\pi^+\pi^-$ lineshape

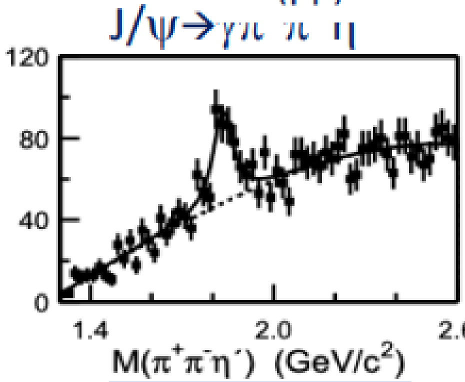
1996: 8 M J/ψ's



PRL 76, 3502

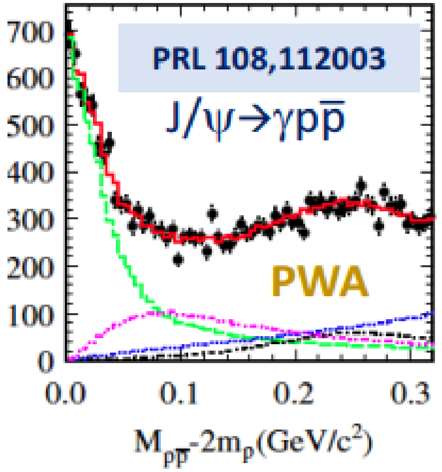
2002: 58 M J/ψ's

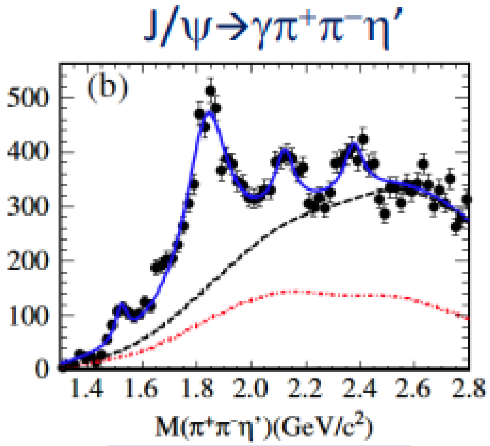




PRL 95,262001

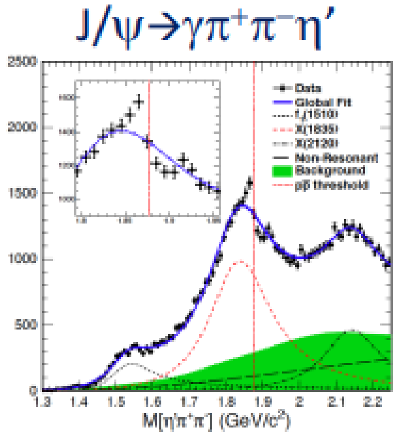
2011: 225 M J/ψ's





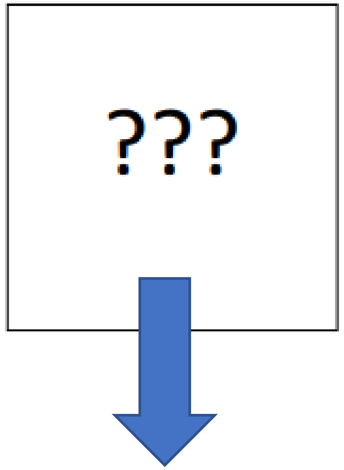
PRL 106,072002

2016: 1.3 B J/ψ's

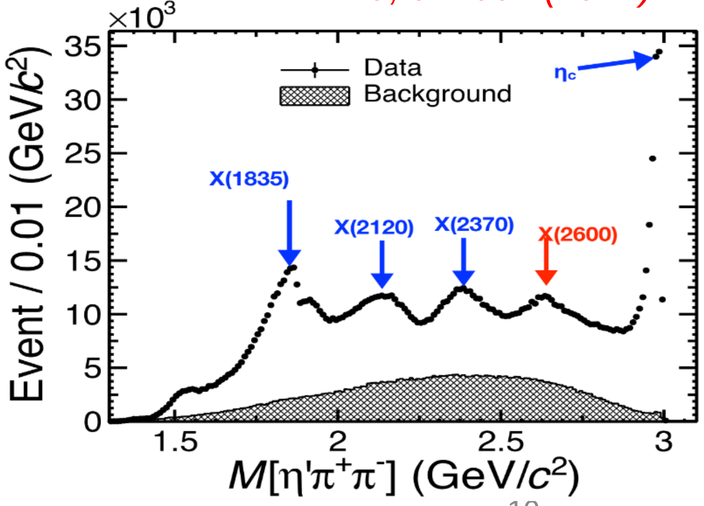


PRL 117,042002

2019: 10 B J/ψ's



PRL 129, 042001 (2022)



You never have enough J/ψ events!

— Stephen Lars Olsen

Heavy “nonstandard” hadron candidates

- Large amount of experimental activity on the “nonstandard” heavy sector
  - e^+e^- direct production: BESIII, Belle, BaBar
  - $pp/p\bar{p}$ promote production: LHCb, CMS, ALTAS…
  - Quarkonia decay: BESIII, Belle, BaBar
  - B, Λ_b decays: Belle, Babar, LHCb

2003-
X(3872)

2005-
X(3915)
Y(4260)
Y_b(10860)

2007-
X(3940)
X(4160)
Y(4360)
Y(4660)
X(4050)
X(4250)
Z(4430)

2009-
X(4140)
X(4350)

2011-
Z_b(10610)
Z_b(10650)

2013-
Z_c(3900)
Z_c(4020)
Z(4200)

2015-
P_c(4380)
P_c(4450)

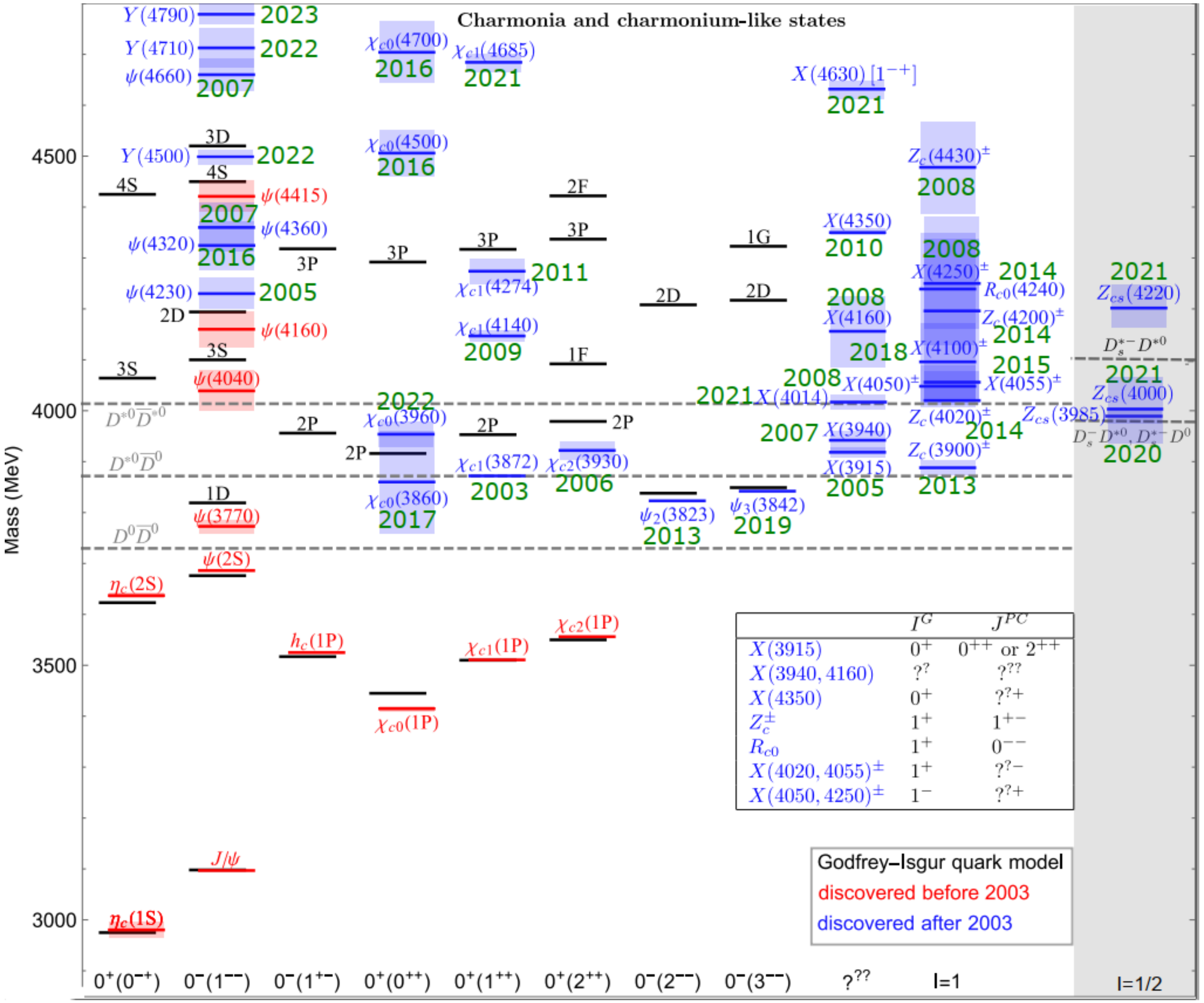
2017-
X(4274)
X(4500)
X(4700)
Y(4220)
Y(4390)

2019-
P_c(4457)
P_c(4440)
P_c(4312)
X(3842)
X(6900)
X_0(2900)
X_1(2900)

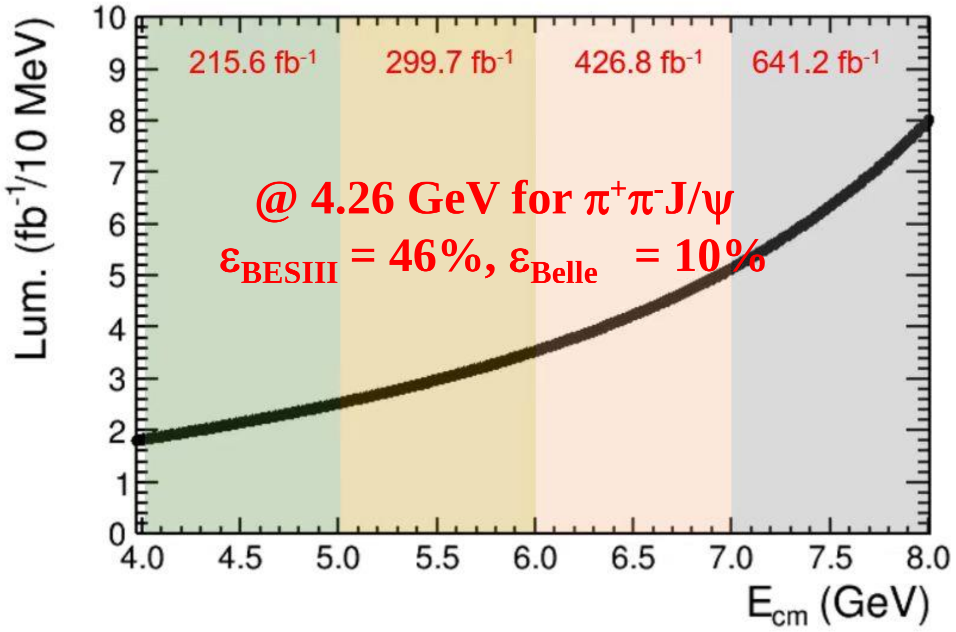
2021-
X(4685)
X(4630)
Z (3985)

- Most of them are with masses in 4-7 GeV.
- However, their properties are still poorly known.

Charmonium (Like) states at STCF

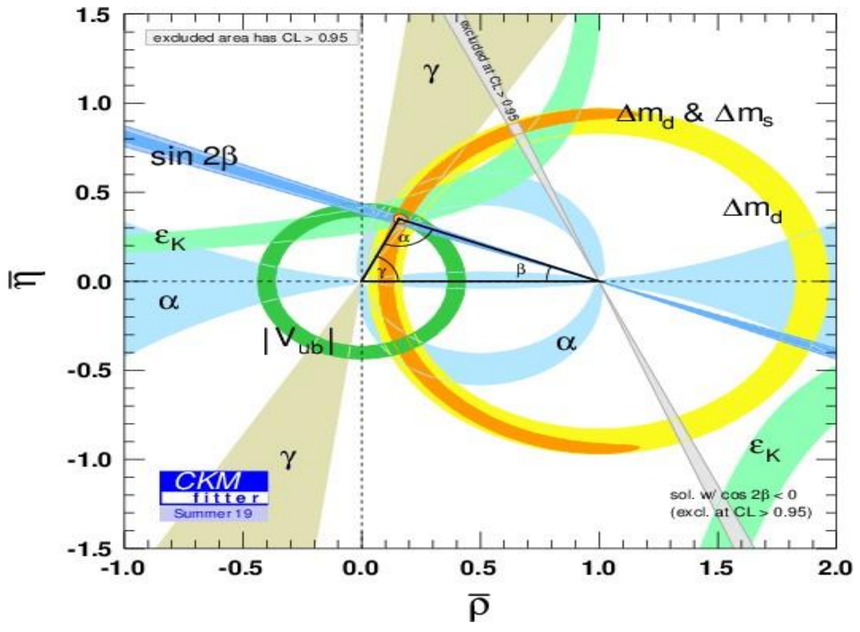


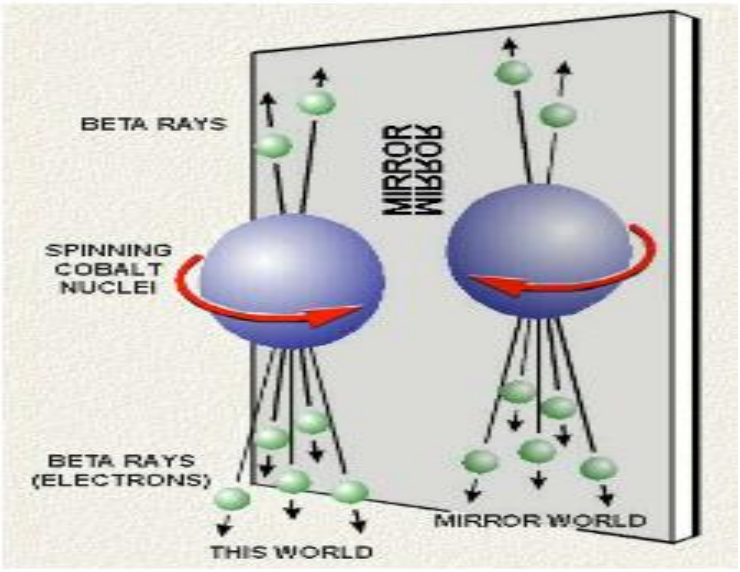
arXiv: 2203.07141



- **Belle II :** ISR approach; B meson decay ($m_R <$ 4.8 GeV)
- **LHCb:** B/Λ_b decay; Prompt production
- **STCF:** Scan with 10 MeV/step, every point has 10 fb^{-1}/year, 3 ab^{-1} in 4-7 GeV

Flavor physics and CPV study





Charm physics

- **LHCb:** huge x-sec, boost, 9 fb^{-1} now (×40 current B factories)
- **B-factories** (Belle(-II), BaBar): more kinematic constrains, clean environment, ~100% trigger efficiency
- **τ-charm factory** : Low backgrounds and high efficiency, Quantum correlations and CP-tagging are unique
- **STCF :**
  - 4×10^9 pairs of $D^{\pm,0}$ and 10^8 D_s pairs per year
    - 10^{10} charm from Belle II/year
  - Highlighted Physics programs
    - Precise measurement of (semi-)leptonic decay (f_D, f_{Ds}, CKM matrix…)
    - D decay strong phase (Determination of γ/ϕ3 angle)
    - $D^0 - \bar{D}^0$ mixing, CPV
    - Rare decay (FCNC, LFV, LNV….)
    - Excite charm meson states D_J, D_{sJ} (mass, width, J^{PC}, decay modes)
    - Charmed baryons (J^{PC}, Decay modes, absolute BF)

	STCF	Belle II	LHCb
Production yields	★★	★★★★	★★★★★
Background level	★★★★★	★★★	★★
Systematic error	★★★★★	★★★	★★
Completeness	★★★★★	★★★	★
(Semi)-Leptonic mode	★★★★★	★★★★	★★
Neutron/K_L mode	★★★★★	★★★☆☆	☆
Photon-involved	★★★★★	★★★★	★☆☆
Absolute measurement	★★★★★	★★★	☆

arXiv:2203.03211

Precision measurements of CKM elements

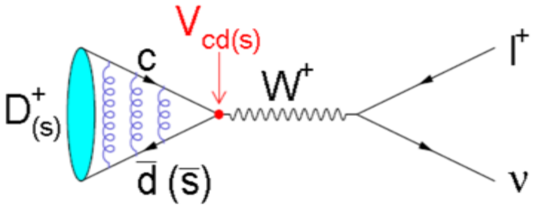
CKM matrix elements are fundamental SM parameters that describe the mixing of quark fields due to weak interaction.

$$\begin{pmatrix} d' \\ s' \\ b' \end{pmatrix} = \begin{pmatrix} V_{ud} V_{us} V_{ub} \\ V_{cd} V_{cs} V_{cb} \\ V_{td} V_{ts} V_{tb} \end{pmatrix} \begin{pmatrix} d \\ s \\ b \end{pmatrix}$$

Leptonic and semileptonic decays of charmed hadrons (D^0, D^+, D_s^+, Λ_c^+) provide ideal testbeds to explore weak and strong interactions

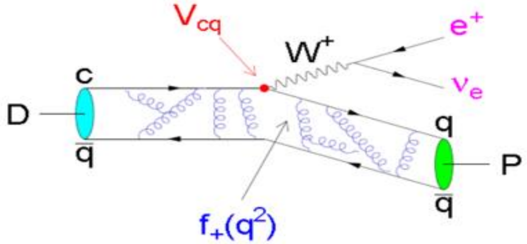
1. $|V_{cs(d)}|$: better test on CKM matrix unitarity
2. (Semi-)leptonic D(s) decays allow for LFU tests
3. $f_{D(s)^+}$, $f^{+K(\pi)}(0)$: test of LQCD

Purely Leptonic:



$$\Gamma(D^+_{(s)} \to \ell^+ \nu_\ell) = \frac{G_F^2 f^2_{D^+_{(s)}}}{8\pi} |V_{cd(s)}|^2 m_\ell^2 m_{D^+_{(s)}} \left(1 - \frac{m_\ell^2}{m^2_{D^+_{(s)}}}\right)^2$$

Semi-Leptonic:



$$\frac{d\Gamma}{dq^2} = \frac{G_F^2}{24\pi^3} |V_{cs(d)}|^2 p^3_{K(\pi)} |f_+^{K(\pi)}(q^2)|^2$$

Prospect of charm leptonic decay at STCF

	BESIII	STCF	Belle II
Luminosity	2.93 fb^{-1} at 3.773 GeV	1 ab^{-1} at 3.773 GeV	50 ab^{-1} at $\Upsilon(nS)$
$\mathcal{B}(D^+ \to \mu^+\nu_\mu)$	$5.1\%_{\rm stat}$ $1.6\%_{\rm syst}$	$0.28\%_{\rm stat}$	$2.8\%_{\rm stat}$
$f^{\mu}_{D^+}$ (MeV)	$2.6\%_{\rm stat}$ $0.9\%_{\rm syst}$	$0.15\%_{\rm stat}$	
$\|V_{cd}\|$	$2.6\%_{\rm stat}$ $1.0\%^{*}_{\rm syst}$	$0.15\%_{\rm stat}$	–
$\mathcal{B}(D^+ \to \tau^+\nu_\tau)$	$20\%_{\rm stat}$ $10\%_{\rm syst}$	$0.41\%_{\rm stat}$	–
$\frac{\mathcal{B}(D^+ \to \tau^+\nu_\tau)}{\mathcal{B}(D^+ \to \mu^+\nu_\mu)}$	$21\%_{\rm stat}$ $13\%_{\rm syst}$	$0.50\%_{\rm stat}$	–
Luminosity	6.3 fb^{-1} at (4.178, 4.226) GeV	1 ab^{-1} at 4.009 GeV	50 ab^{-1} at $\Upsilon(nS)$
$\mathcal{B}(D_s^+ \to \mu^+\nu_\mu)$	$2.4\%_{\rm stat}$ $3.0\%_{\rm syst}$	$0.30\%_{\rm stat}$	$0.8\%_{\rm stat}$ $1.8\%_{\rm syst}$
$f^{\mu}_{D_s^+}$ (MeV)	$1.2\%_{\rm stat}$ $1.5\%_{\rm syst}$	$0.15\%_{\rm stat}$	–
$\|V_{cs}\|$	$1.2\%_{\rm stat}$ $1.5\%_{\rm syst}$	$0.15\%_{\rm stat}$	–
$\mathcal{B}(D_s^+ \to \tau^+\nu_\tau)$	$1.7\%_{\rm stat}$ $2.1\%_{\rm syst}$	$0.24\%_{\rm stat}$	$0.6\%_{\rm stat}$ $2.7\%_{\rm syst}$
$f^{\tau}_{D_s^+}$ (MeV)	$0.8\%_{\rm stat}$ $1.1\%_{\rm syst}$	$0.11\%_{\rm stat}$	–
$\|V_{cs}\|$	$0.8\%_{\rm stat}$ $1.1\%_{\rm syst}$	$0.11\%_{\rm stat}$	
$\overline{f}^{\mu\&\tau}_{D_s^+}$ (MeV)	$0.7\%_{\rm stat}$ $0.9\%_{\rm syst}$	$0.09\%_{\rm stat}$	$0.3\%_{\rm stat}$ $1.0\%_{\rm syst}$
$\|\overline{V}^{\mu\&\tau}_{cs}\|$	$0.7\%_{\rm stat}$ $0.9\%_{\rm syst}$	$0.09\%_{\rm stat}$	–
$f_{D_s^+}/f_{D^+}$	$1.4\%_{\rm stat}$ $1.7\%_{\rm syst}$	$0.21\%_{\rm stat}$	–
$\frac{\mathcal{B}(D_s^+ \to \tau^+\nu_\tau)}{\mathcal{B}(D_s^+ \to \mu^+\nu_\mu)}$	$2.9\%_{\rm stat}$ $3.5\%_{\rm syst}$	$0.38\%_{\rm stat}$	$0.9\%_{\rm stat}$ $3.2\%_{\rm syst}$

Theory : 0.2%(0.1% expected)

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* assuming Belle II improved systematics by a factor 2

Stat. uncertainty is closed to theory precision
Sys. is challenging

Probe CP violation at tau-charm factory

Billions hyperon pairs from J/ψ decay, clean topology, background free

Transversely polarized, spin correlation

Sensitivity: $A_{CP}\sim10^{-4}$, $\xi\sim0.05^{\circ}$

CP in hyperon decay

CP in tau decay/production

Peak cross section in $\sqrt{s}$ =4-5 GeV, $\sigma_{\tau\tau}\approx$ 3.5 nb, 10 ab^{-1} data in total

Sensitivity of τ decay with 1ab^{-1} @ 4.26 GeV $\sim9.7\times10^{-4}$

CP in charm mixing

Billions $D^0/\overline{D}^0$, threshold production, quantum coherence with $(D^0\overline{D}^0)_{\mathrm{CP}=-}$ or $(D^0\overline{D}^0)_{\mathrm{CP}=+}$

Sensitivity: $x\sim0.035\%$, y$\sim$0.023%, $r_{CP}\sim0.017$, $\alpha_{CP}\sim1.3^{\circ}$

CPT in kaon mixing

CP tagging and flavor tagging of $K^0/\overline{K}^0$ available from J/ψ decay

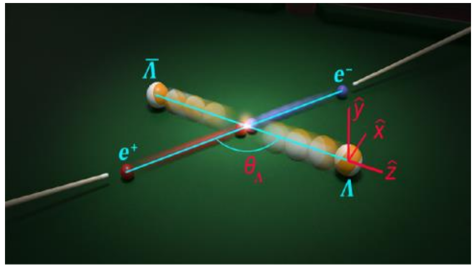
CP variables determined with time-dependent decay rate

CPT Sensitivity: $\eta_{\pm}\sim10^{-3}$, $\Delta\phi_{\pm}\sim0.05^{\circ}$

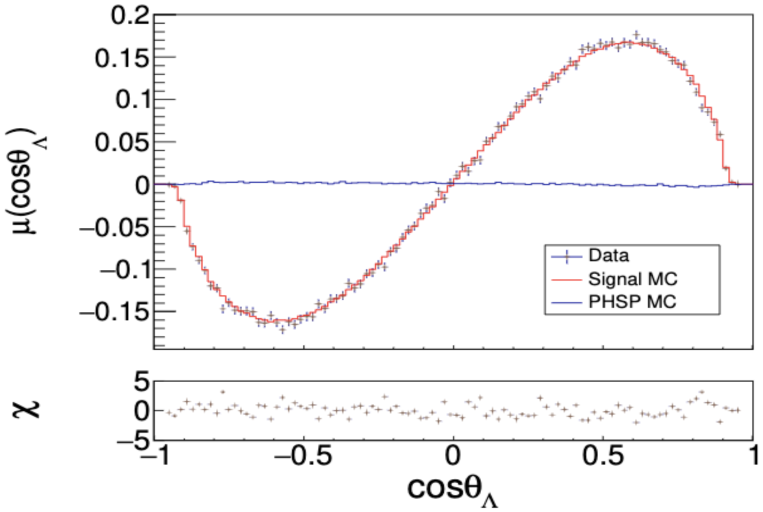
Polarization of Λ hyperons and CPV

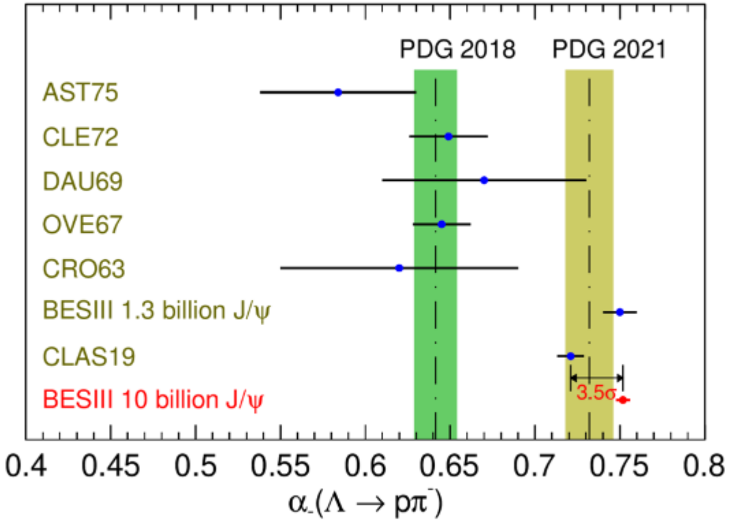
- Updated results based on 10B J/ψ events: ~0.42M signals
- Decay asymmetries with best precisions ever

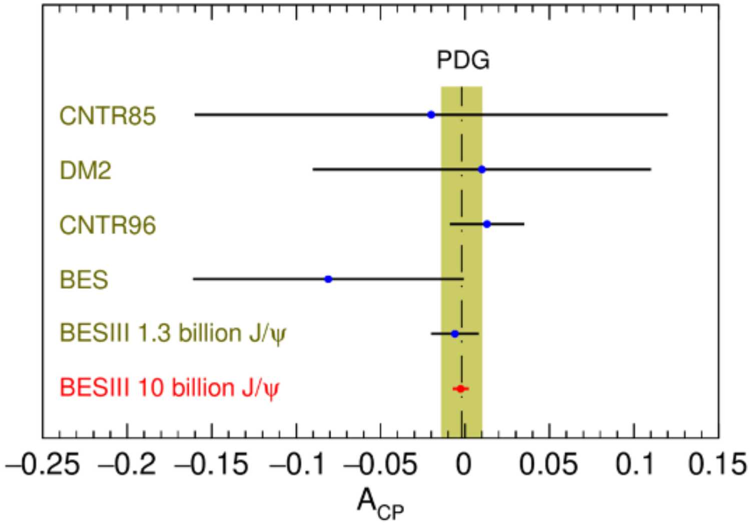
CP test $A_{CP} = \frac{\alpha_- + \alpha_+}{\alpha_- - \alpha_+}$



PRL 129, 131801 (2022)





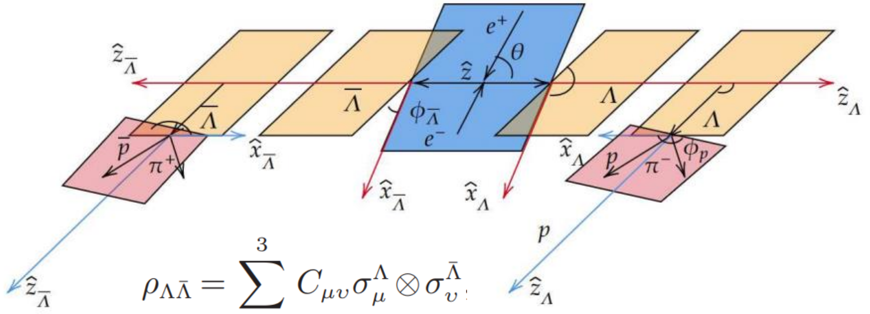


Par.	This Work*	Previous results **	PDG 2018 ***
$\alpha_{J/\psi}$	$0.4748 \pm 0.0022 \pm 0.0024$	$0.461 \pm 0.006 \pm 0.007$	0.469 ± 0.027
$\Delta\Phi$	$0.7521 \pm 0.0042 \pm 0.0080$	$0.740 \pm 0.010 \pm 0.009$	-
α_-	$0.7519 \pm 0.0036 \pm 0.0019$	$0.750 \pm 0.009 \pm 0.004$	0.642 ± 0.013
α_+	$-0.7559 \pm 0.0036 \pm 0.0029$	$-0.758 \pm 0.010 \pm 0.007$	-0.71 ± 0.08
A_{CP}	$-0.0025 \pm 0.0046 \pm 0.0011$	$0.006 \pm 0.012 \pm 0.007$	-
$\alpha_{\pm,avg.}$	$0.7542 \pm 0.0010 \pm 0.0020$	$0.754 \pm 0.003 \pm 0.002$	-

~7σ upward shift from all previous measurements

0.5% level sensitivity for CPV test
SM prediction: 10^{-4}~10^{-5}

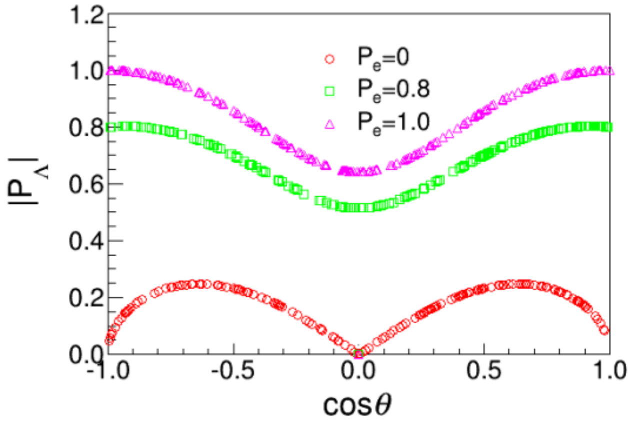
CPV in Λ decay with polarized electron beam

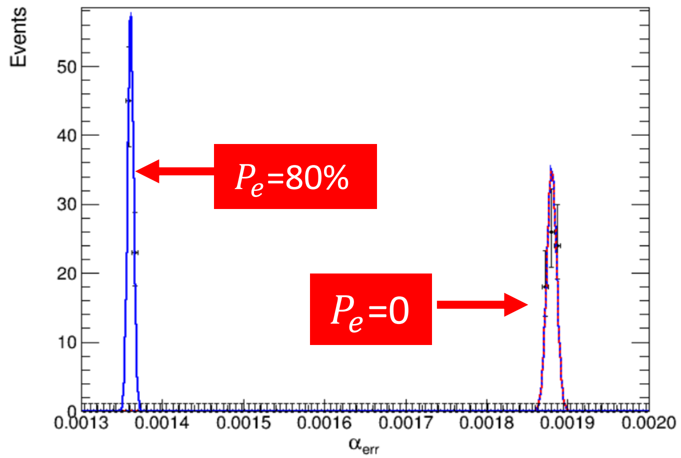


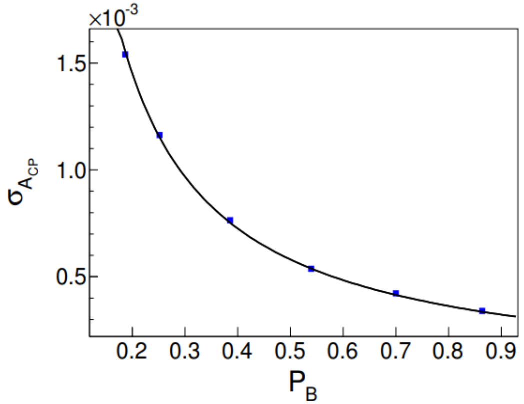
$$\rho_{\Lambda\bar{\Lambda}} = \sum_{\mu\upsilon=0}^{3} C_{\mu\upsilon}\sigma_{\mu}^{\Lambda}\otimes\sigma_{\upsilon}^{\bar{\Lambda}}$$

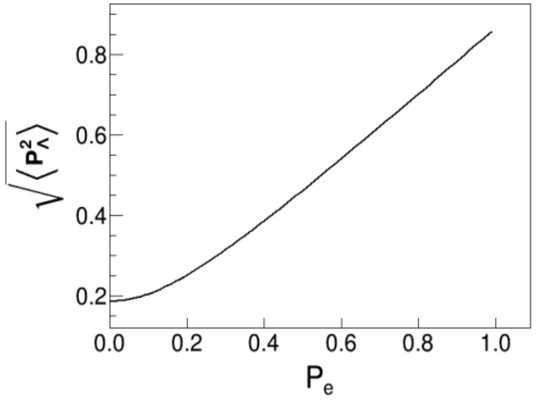
$$\begin{bmatrix} 1+\alpha_\psi\cos^2\theta & \gamma_\psi P_e\sin\theta & \beta_\psi\sin\theta\cos\theta & (1+\alpha_\psi)P_e\cos\theta \\ \gamma_\psi P_e\sin\theta & \sin^2\theta & 0 & \gamma_\psi\sin\theta\cos\theta \\ -\beta_\psi\sin\theta\cos\theta & 0 & \alpha_\psi\sin^2\theta & -\beta_\psi P_e\sin\theta \\ -(1+\alpha_\psi)P_e\cos\theta & -\gamma_\psi\sin\theta\cos\theta & -\beta_\psi P_e\sin\theta & -\alpha_\psi-\cos^2\theta \end{bmatrix},$$

$$\mathbf{P}_\Lambda = \frac{\gamma_\psi P_e\sin\theta\hat{x}_1 - \beta_\psi\sin\theta\cos\theta\hat{y}_1 - (1+\alpha_\psi)P_e\cos\theta\hat{z}_1}{1+\alpha_\psi\cos^2\theta}.$$



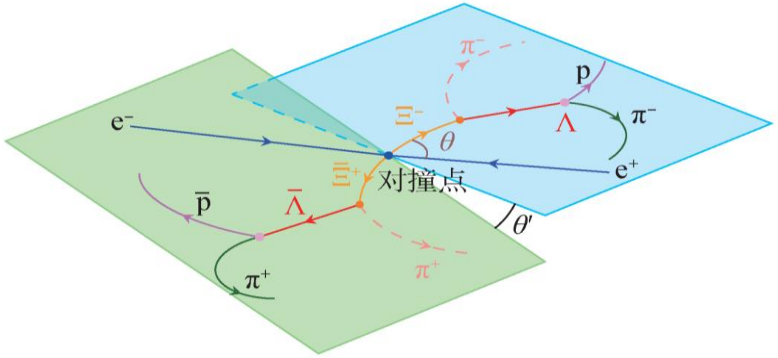






- Large statistics and electron polarization will improve the sensitivity of CPV significantly.
- The sensitivity of CPV follows : $\sigma_{A_{CP}} \approx \sqrt{\frac{3}{2}}\frac{1}{\alpha_1\sqrt{N_{sig}}\sqrt{\langle P_B^2\rangle}}.$

CPV in $J/\psi \to \Xi\bar{\Xi}$ decay



Parameter	This work	Previous result	
α_ψ	$0.586 \pm 0.012 \pm 0.010$	$0.58 \pm 0.04 \pm 0.08$	38
$\Delta\Phi$	$1.213 \pm 0.046 \pm 0.016$ rad.	–	
α_Ξ	$-0.376 \pm 0.007 \pm 0.003$	-0.401 ± 0.010	22
ϕ_Ξ	$0.011 \pm 0.019 \pm 0.009$ rad.	-0.037 ± 0.014 rad.	22
$\alpha_{\bar{\Xi}}$	$0.371 \pm 0.007 \pm 0.002$	–	
$\phi_{\bar{\Xi}}$	$-0.021 \pm 0.019 \pm 0.007$ rad.	–	
α_Λ	$0.757 \pm 0.011 \pm 0.008$	$0.750 \pm 0.009 \pm 0.004$	3
$\alpha_{\bar{\Lambda}}$	$-0.763 \pm 0.011 \pm 0.007$	$-0.758 \pm 0.010 \pm 0.007$	3
$\xi_P - \xi_S$	$(1.2 \pm 3.4 \pm 0.8) \times 10^{-2}$ rad.	–	
$\delta_P - \delta_S$	$(-4.4 \pm 3.6 \pm 1.8) \times 10^{-2}$ rad.	$(8.7 \pm 3.3) \times 10^{-2}$ rad.	2
A^{Ξ}_{CP}	$(6.0 \pm 13.4 \pm 5.6) \times 10^{-3}$	–	
$\Delta\phi^{\Xi}_{CP}$	$(-4.8 \pm 13.7 \pm 2.9) \times 10^{-3}$ rad.	–	
A^{Λ}_{CP}	$(-3.7 \pm 11.7 \pm 9.0) \times 10^{-3}$	$(-6 \pm 12 \pm 7) \times 10^{-3}$	3
$< \phi_\Xi >$	$0.016 \pm 0.014 \pm 0.007$ rad.		

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- 1.3 B J/ψ yields 73k $J/\psi \to \Xi^-\bar{\Xi}^+$ events at BESIII.
- First limit on weak phase of a P-wave amplitude!

Strong phase

Weak phase

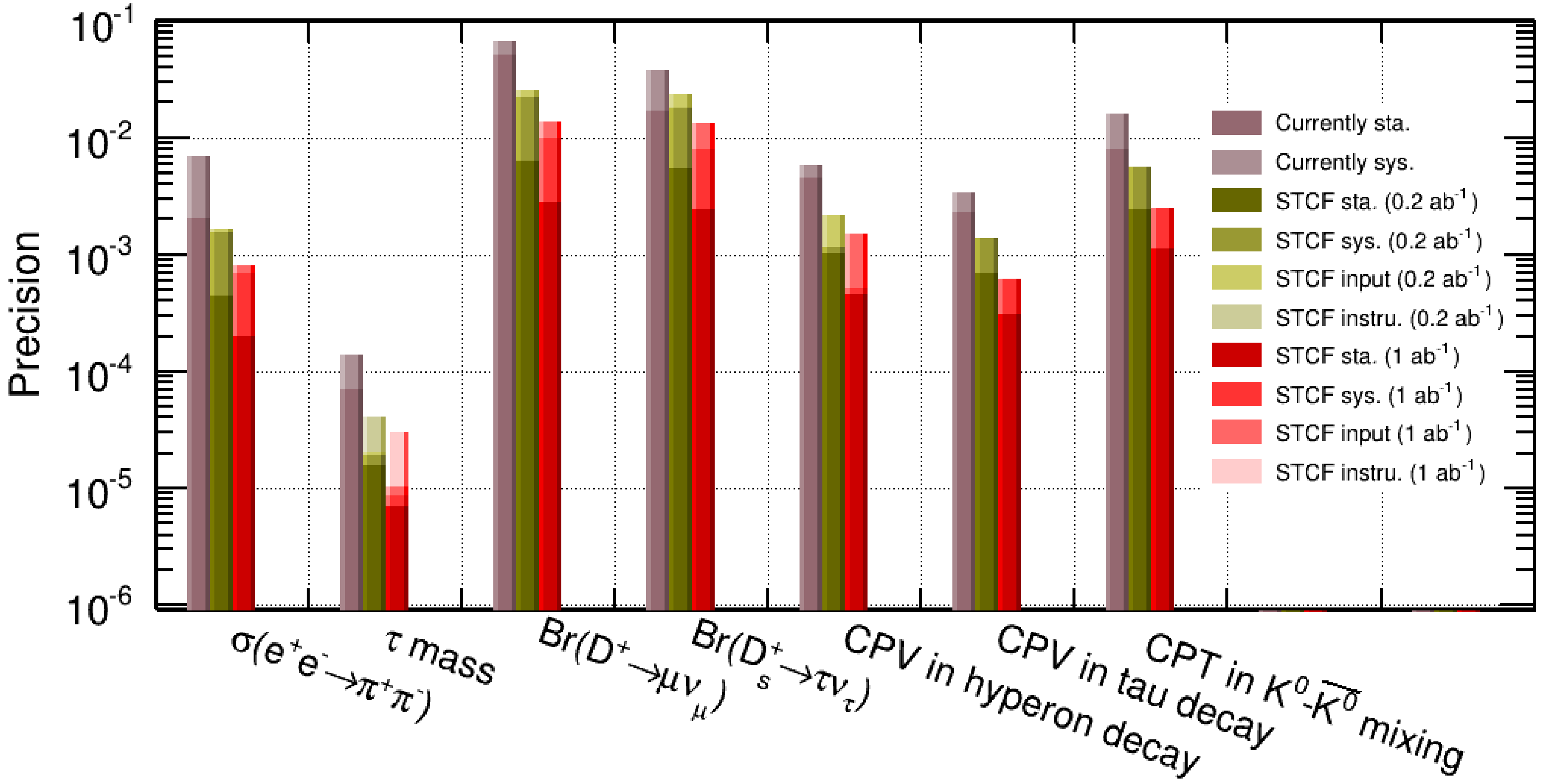
$$\mathcal{A}^Y_{CP} \equiv \frac{\alpha_Y + \alpha_{\bar{Y}}}{\alpha_Y - \alpha_{\bar{Y}}} = -\sin(\delta^P_{y\pi} - \delta^S_{y\pi})\sin(\xi^P_Y - \xi^S_Y)$$

$$\xi^P_\Xi - \xi^S_\Xi = 0.7^\circ \pm 2.0^\circ \quad \in \{-2.6^\circ, +4.0^\circ\} \ (90\% \text{ C.L.})$$

$$\delta^P_{\Lambda\pi} - \delta^S_{\Lambda\pi} = -2.3^\circ \pm 2.1^\circ \quad \in \{-5.8^\circ, +1.2^\circ\} \ (90\% \text{ C.L.})$$

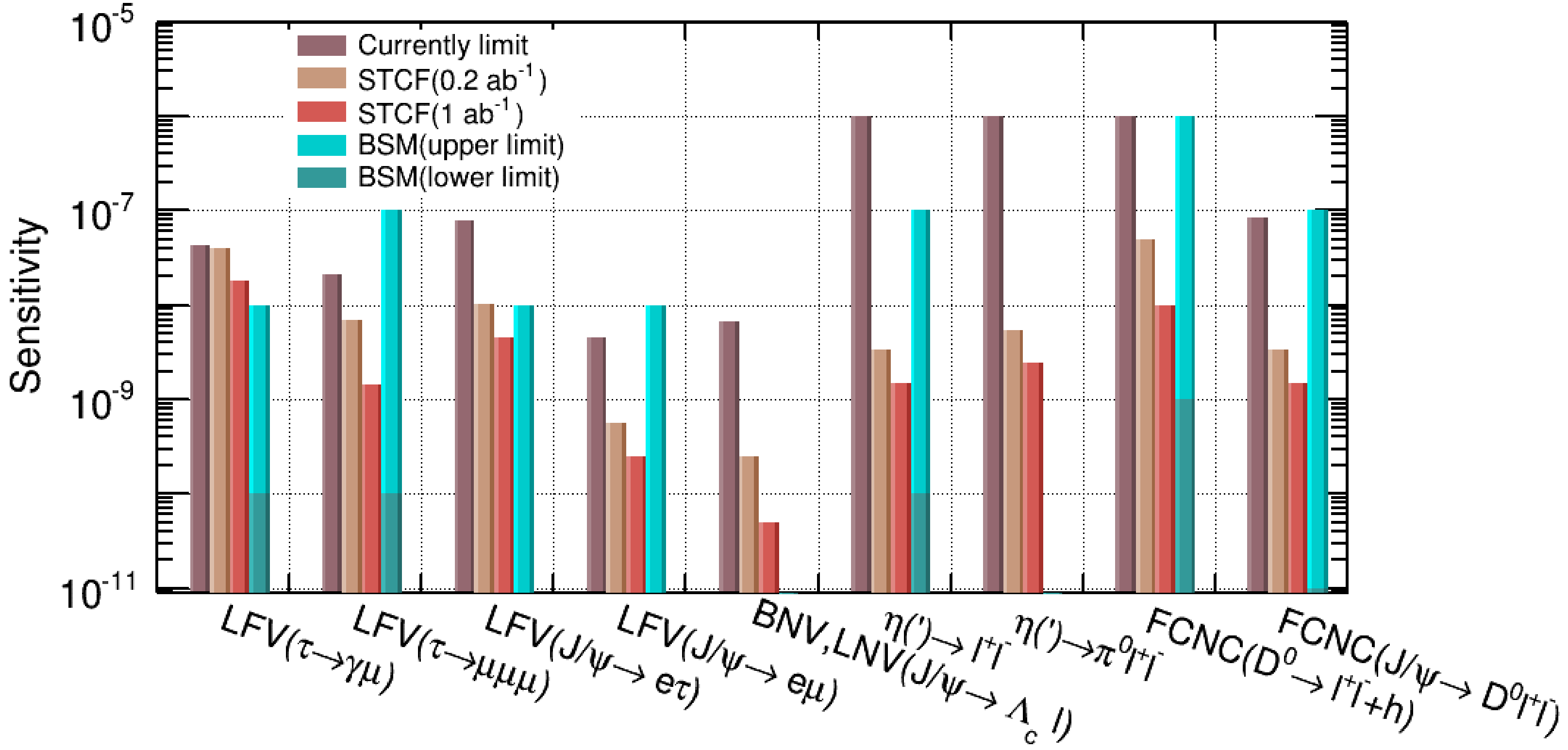
- STCF will produce 3.4 trillion J/ψ, the sensitivity is expected to be $\Delta(\xi^P_\Xi - \xi^S_\Xi) \sim 0.04^\circ$
- SM prediction of $\xi^P_\Xi - \xi^S_\Xi$ to be $(-0.01 \pm 0.01)^\circ$
- Any significance deviation from zero will indicate new CPV beyond SM!

Sensitivity of precision measurements



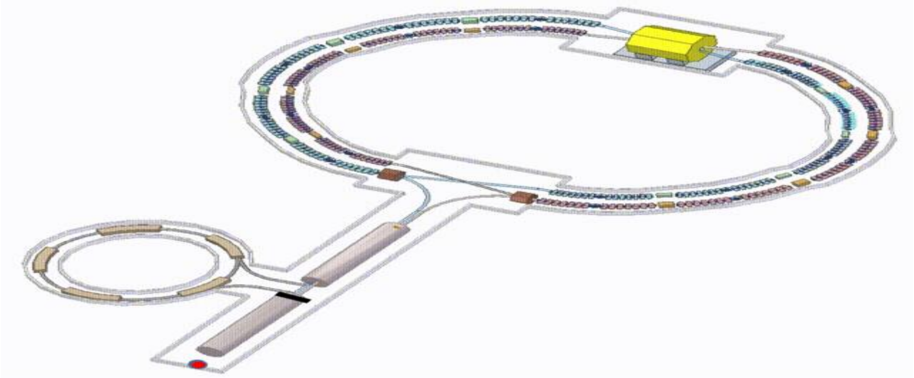
- Precision frontier for testing of SM parameters, uncertainties from reducible (selection-based), and irreducible sources (theoretical input, instrument effect).

Sensitivity of rare/forbidden decays



- Sensitivity of various rare/forbidden decays from STCF measurements are compared with various BSM models.
- The excellent precision from STCF can be used to distinguish from various BSM models.

STCF accelerator

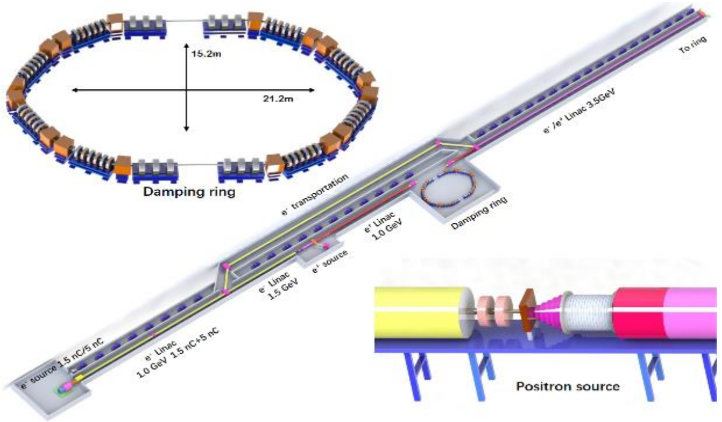


Challenge： realize luminosity of >0.5x10^{35} cm^{-2} s^{-1}

$$L(cm^{-2}s^{-1}) = \frac{\gamma\, n_b\, I_b}{2\, e\, r_e \beta_y^*} H\, \xi_y$$

Interaction Region: Large Piwinski Angle Collision + Crabbed Wais

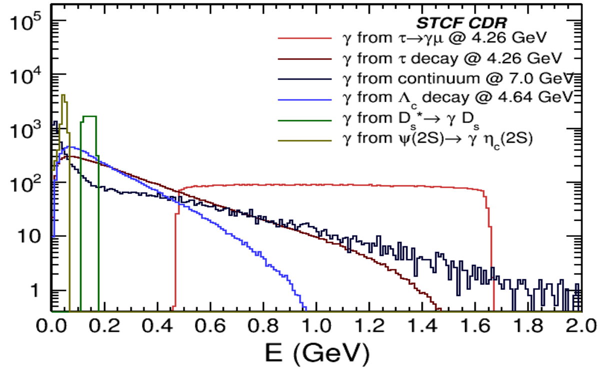
Parameters	Phase1	Phase2
Circumference/m	600~800	600~800
Optimized Beam Energy/GeV	2.0	2.0
Beam Energy Range/GeV	1-3.5	1-3.5
Current/A	1.5	2.0
Emittance $(\varepsilon_x/\varepsilon_y)$/nm·rad	6/0.06	5/0.05
β Function @IP (β_x^*/β_y^*)/mm	60/0.6	50/0.5(estimated)
Full Collision Angle 2θ/mrad	60	60
Tune Shift ξy	0.06	0.08
Hourglass Factor	0.8	0.8
Aperture and Lifetime	15σ, 1000s	15σ, 1000s
Luminosity @Optimized Energy/ × 10^{35}cm^{-2}s^{-1}	~0.5	~1.0

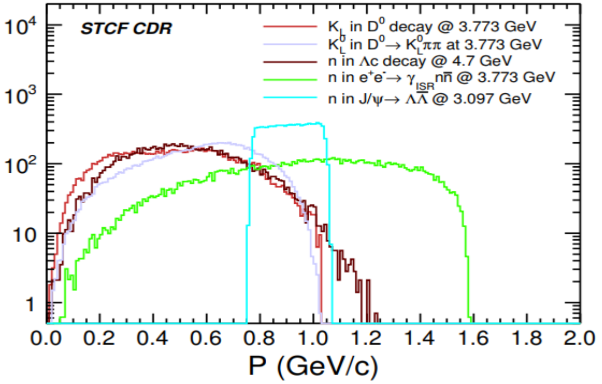


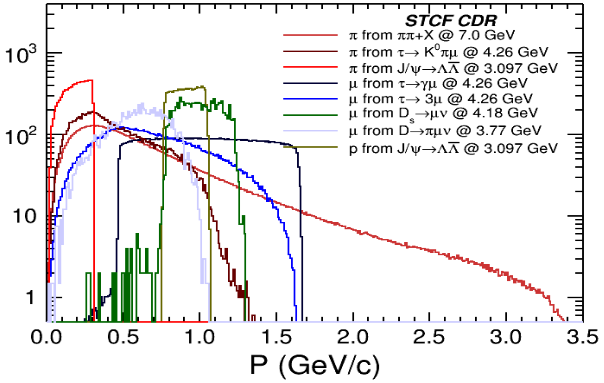
Injector:

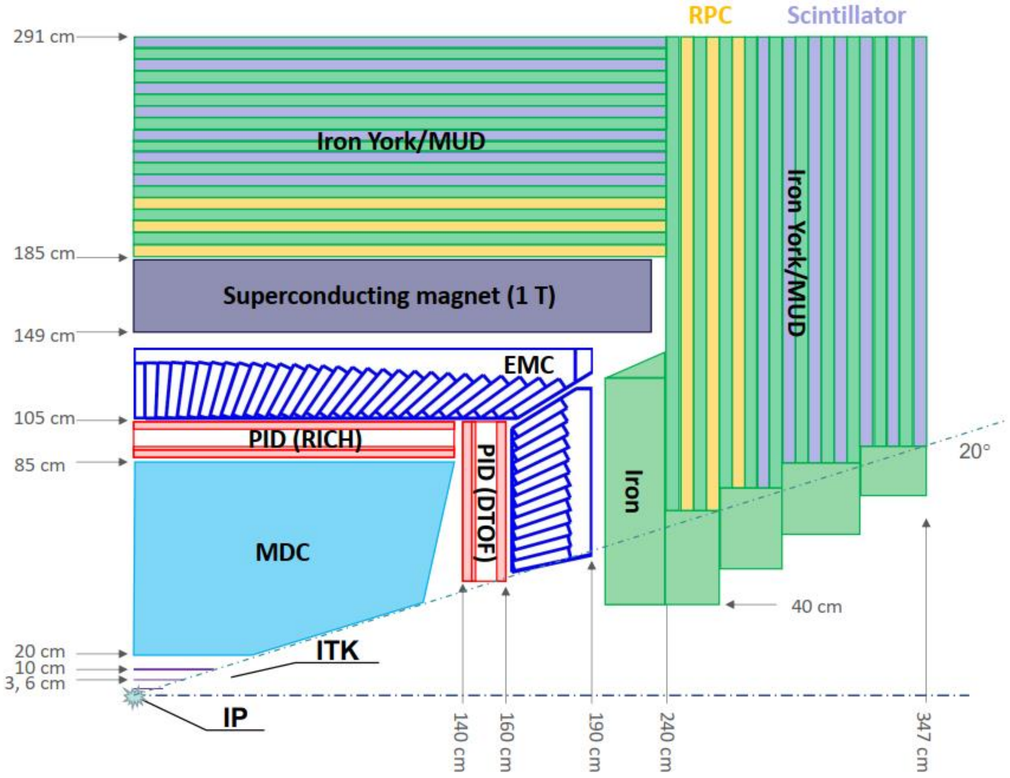
- Length: 400m
- e$^+$, a convertor, a linac and a damping ring, 0.5 GeV
- e$^-$, a polarized e- source, accelerated to 0.5 GeV
- No booster, 0.5 GeV→1~3.5 GeV

STCF detector









Requirement:

- High detection efficiency and good resolution
- Superior PID ability
- Tolerance to high rate/background environment

ITK

<0.25%X0 / layer

σ_{xy}< 100 μm

MDC

σ_{xy}< 130 μm

σp/p ~ 0.5% @ 1 GeV

PID

π/K (and K/p): 3-4σ separation up to 2GeV/c

EMC

E range: 0.025-3.5 GeV

σ_E @ 1 GeV: 2 .5% in barrel, 4% at endcaps

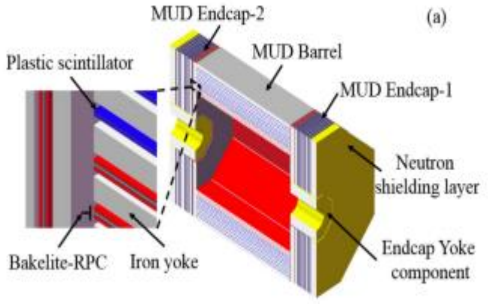
Pos. Res. : ~ 4 mm

MUD

0.4 - 1.8 GeV

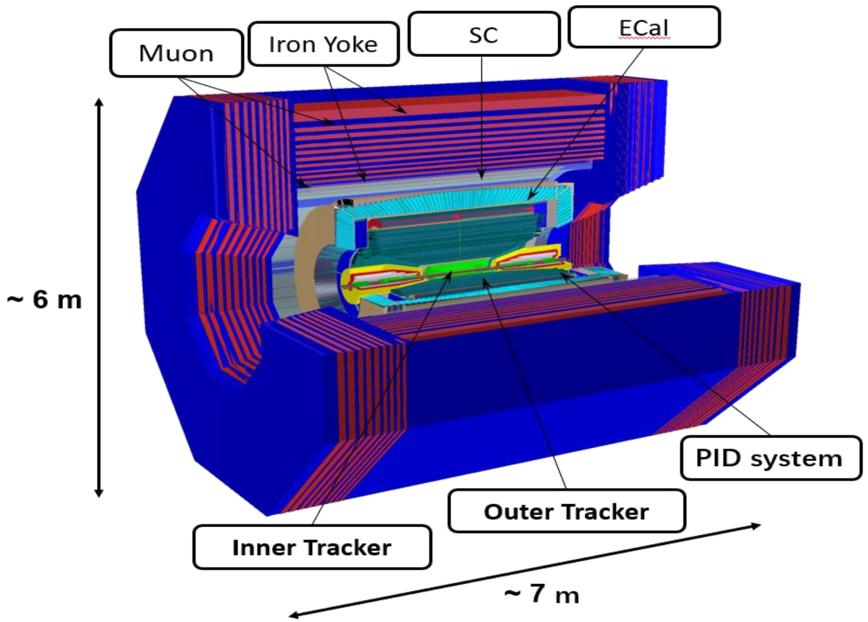
π suppression >30

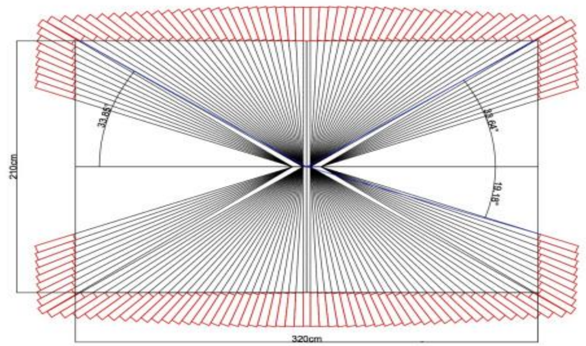
Detector options



Muon detector

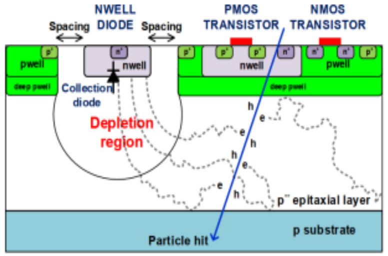
- Bakelite RPC + Scintillator strips



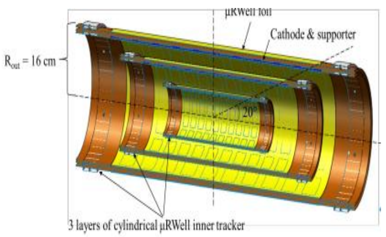


EM calorimeter

- Pure CsI crystal + APD

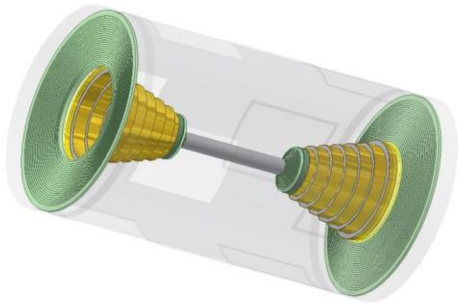


单片有源像素探测器



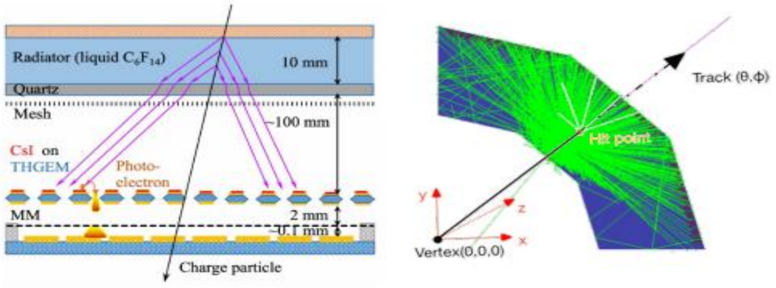
Inner Tracker

- MPGD: Cylindrical μRWELL
  - Silicon: CMOS MAPS



Central Tracker

- Drift Chamber with extra-low mass and small cell



Particle Identification

- Barrel: RICH
- EndCap: DIRC-Like TOF

Tentative plan of STCF

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032-2042	2043-2046
Form collaboration	■	■	■	■												
Conception design CDR	■	■	■	■												
R&D (TDR)	■	■	■	■	■	■	■	■								
Construction								■	■	■	■	■	■	■		
Operation															■	
Upgrade																■

Summary

- STCF is the next generation tau-charm factory, one of the crucial precision frontier aiming for understanding QCD, testing EW models and probing new physics.
- Many activities on physics/detector/accelerator, three volumes CDR finished.
- Key technology R&D project is now fully funded by Anhui Province, Hefei city and USTC (0.42 B RMB). The project is being conducted.
- An International collaboration is necessary to boost the construction of the project.

Thanks