Overview of the Belle II experiment

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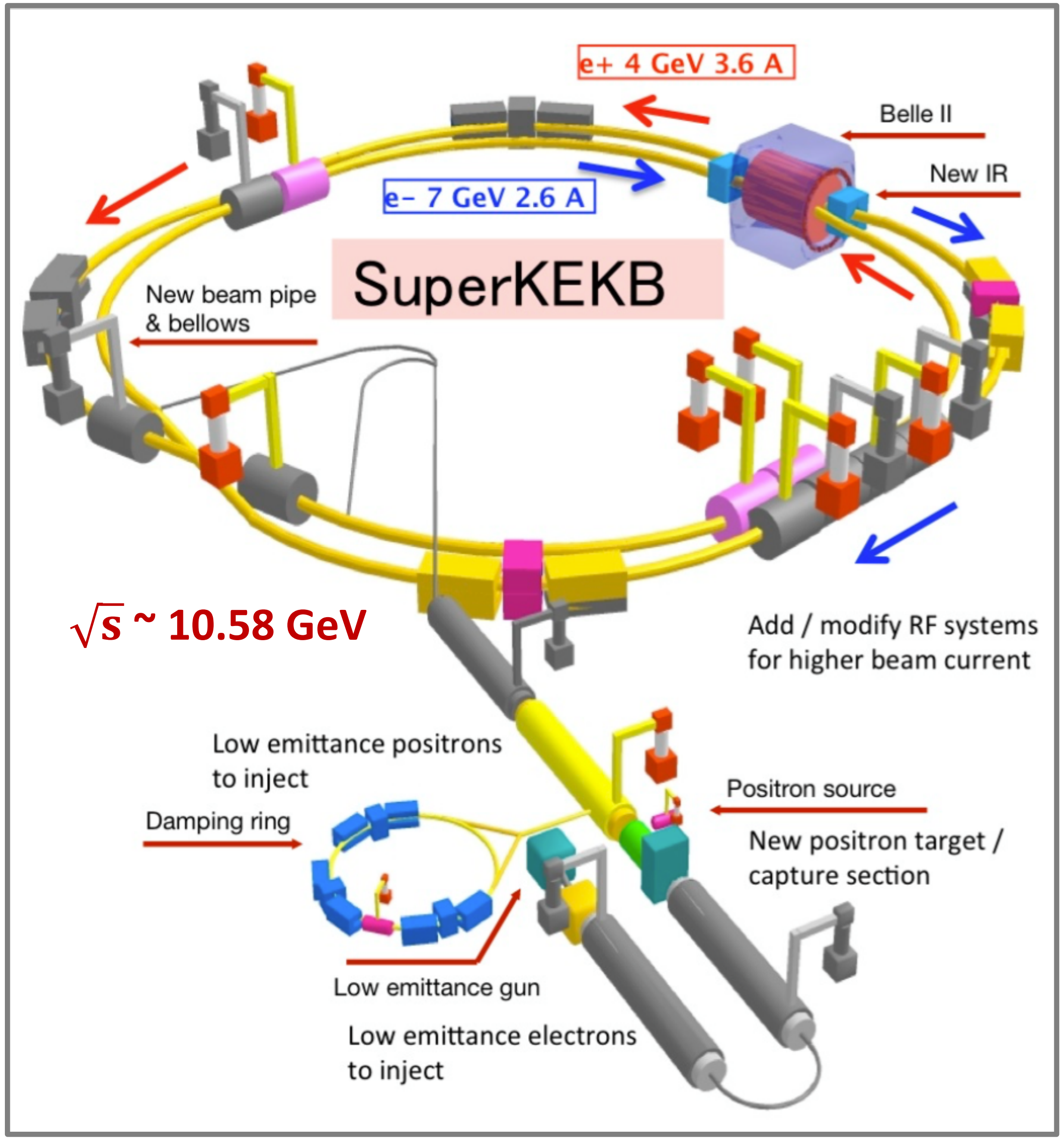
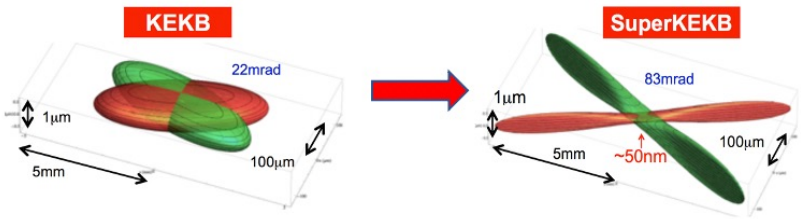
SuperKEKB and Belle II

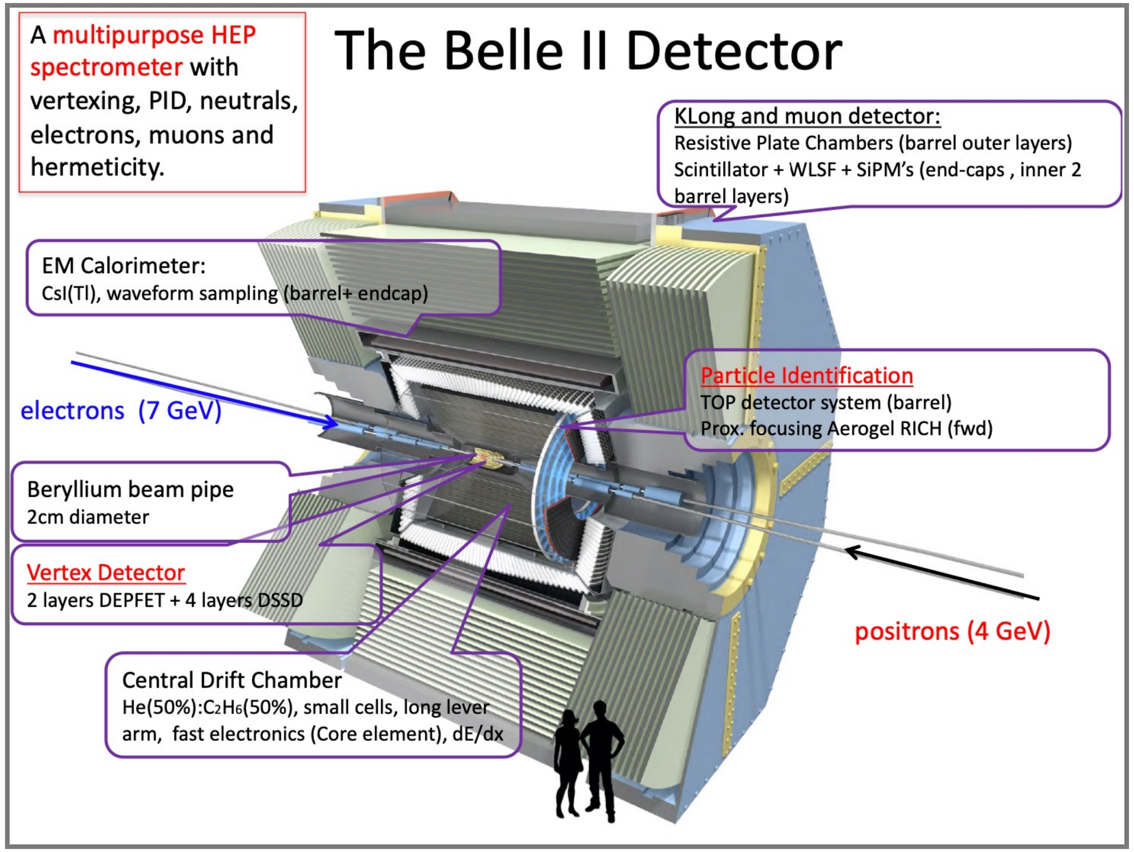




Nano-beam design:

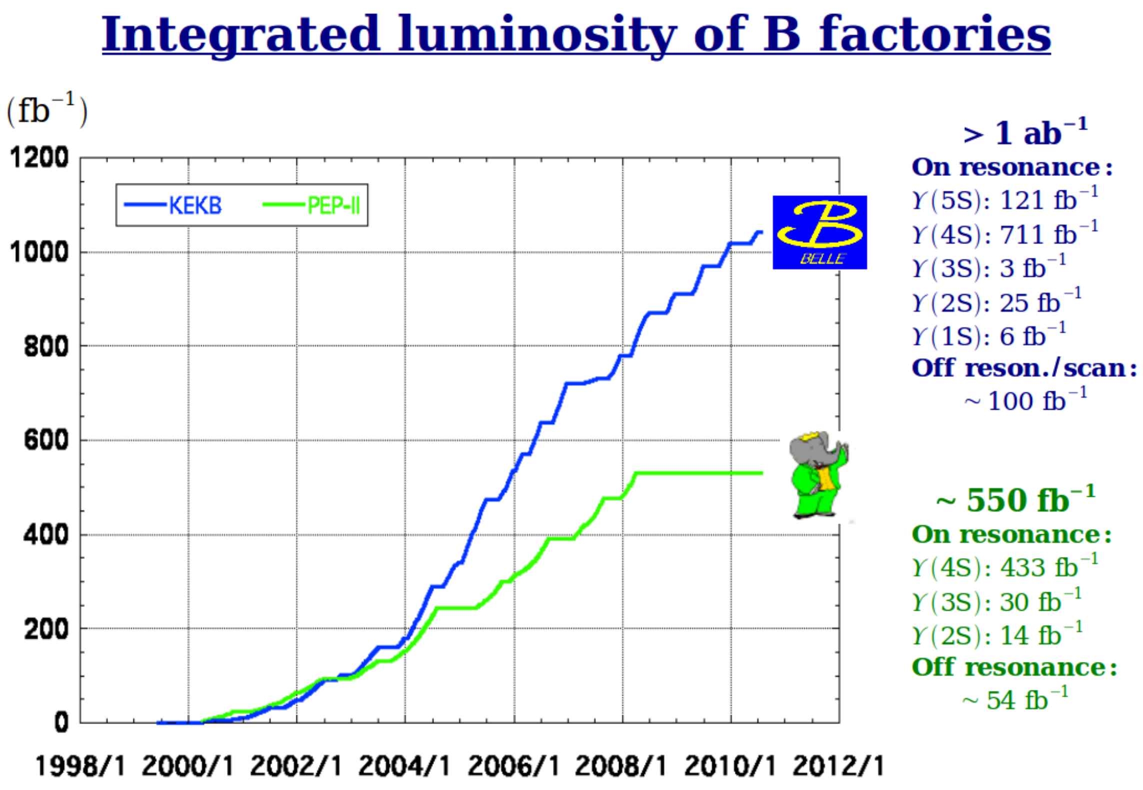
Beam squeezing: ×20 smaller; Beam current: ×2 larger

Target peak luminosity: KEKB×30



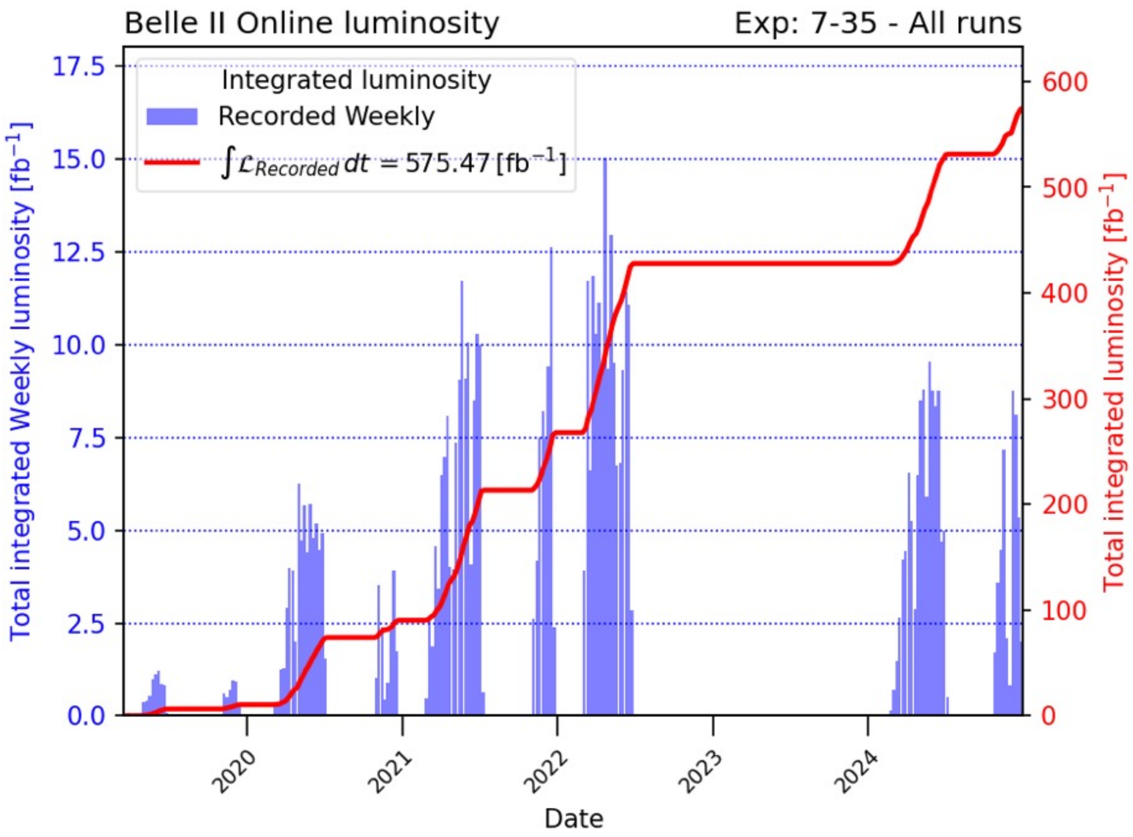
Belle and Belle II Datasets

- **Belle (1999 - 2012)**
- **Belle II RUN-I (2019 - 2023)**
- **Belle II RUN-II (2014 - 2025)**



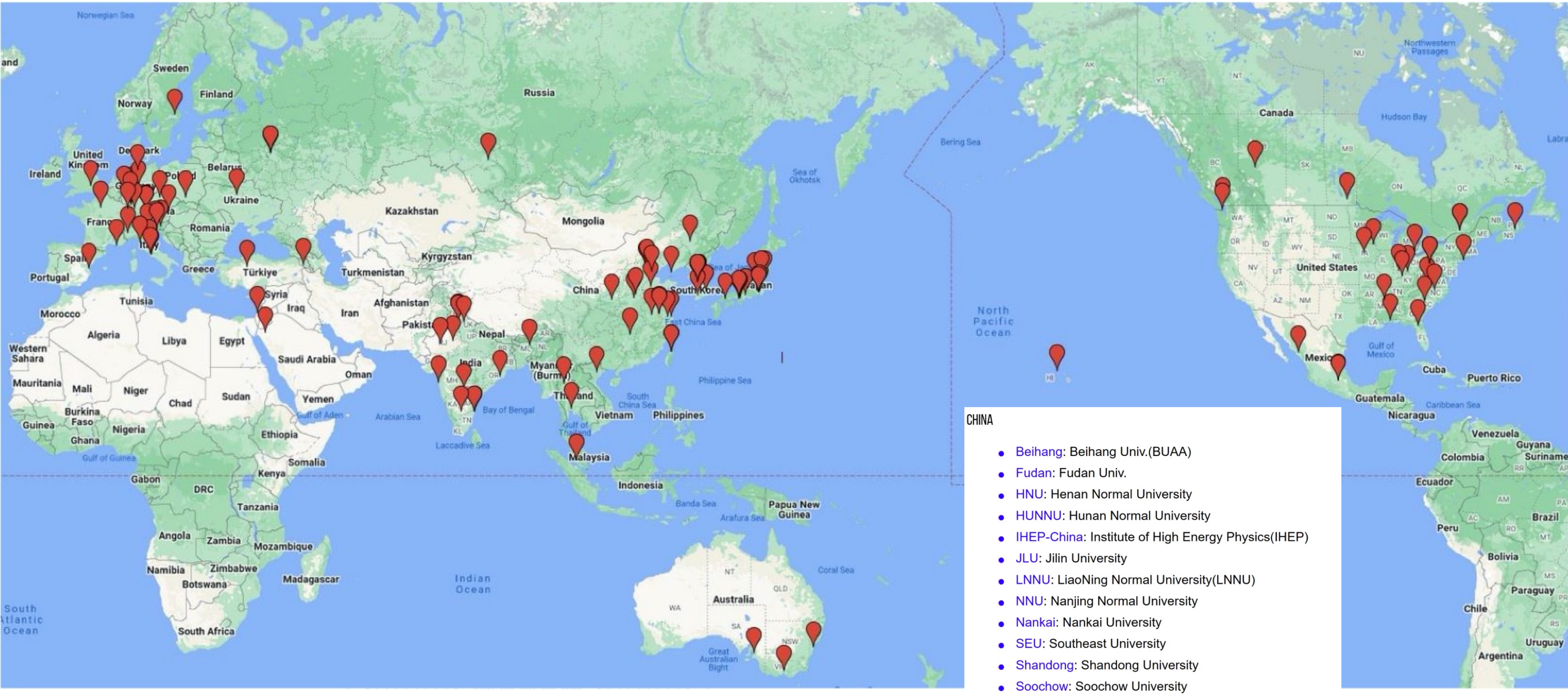
In December 2024

WORLD RECORD: $5.1\times10^{34}\ \mathrm{cm^{-2}s^{-1}}$



Most data at or near the $\Upsilon(4S)$ resonance, and 19.6 fb^{-1} near $\Upsilon(10753)$.

International Belle II collaboration

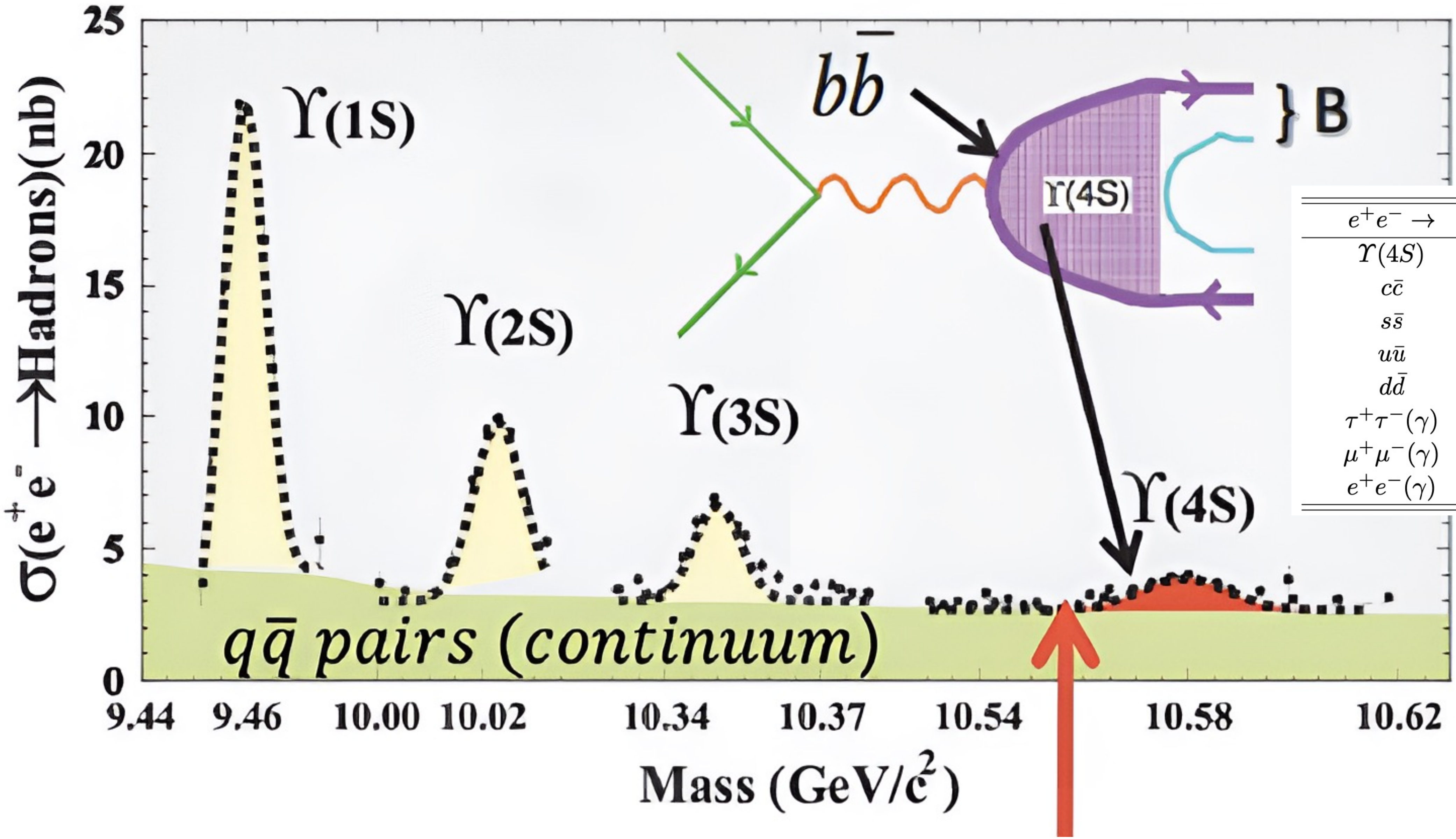


CHINA

- Beihang: Beihang Univ.(BUAA)
- Fudan: Fudan Univ.
- HNU: Henan Normal University
- HUNNU: Hunan Normal University
- IHEP-China: Institute of High Energy Physics(IHEP)
- JLU: Jilin University
- LNNU: LiaoNing Normal University(LNNU)
- NNU: Nanjing Normal University
- Nankai: Nankai University
- SEU: Southeast University
- Shandong: Shandong University
- Soochow: Soochow University
- USTC: Univ. of Science and Technology of China(USTC)
- XJTU: Xi'an Jiaotong University
- ZZU: Zhengzhou University

Belle II now has grown to 1229 researchers from 28 countries/regions.

Belle II physics



$e^+e^- \to$	Cross section [nb]
$\Upsilon(4S)$	1.05 ± 0.10
$c\bar{c}$	1.30
$s\bar{s}$	0.38
$u\bar{u}$	1.61
$d\bar{d}$	0.40
$\tau^+\tau^-(\gamma)$	0.919
$\mu^+\mu^-(\gamma)$	1.148
$e^+e^-(\gamma)$	300 ± 3

Belle II physics

The Belle II Physics Book: [PTEP 2019 (2019) 12, 123C01]

A_{CP} in Charm

Charmed baryon

$\Upsilon(10753)$ study

CKM matrix element

Dark Higgs

Lepton-Flavor universality

B rare decays

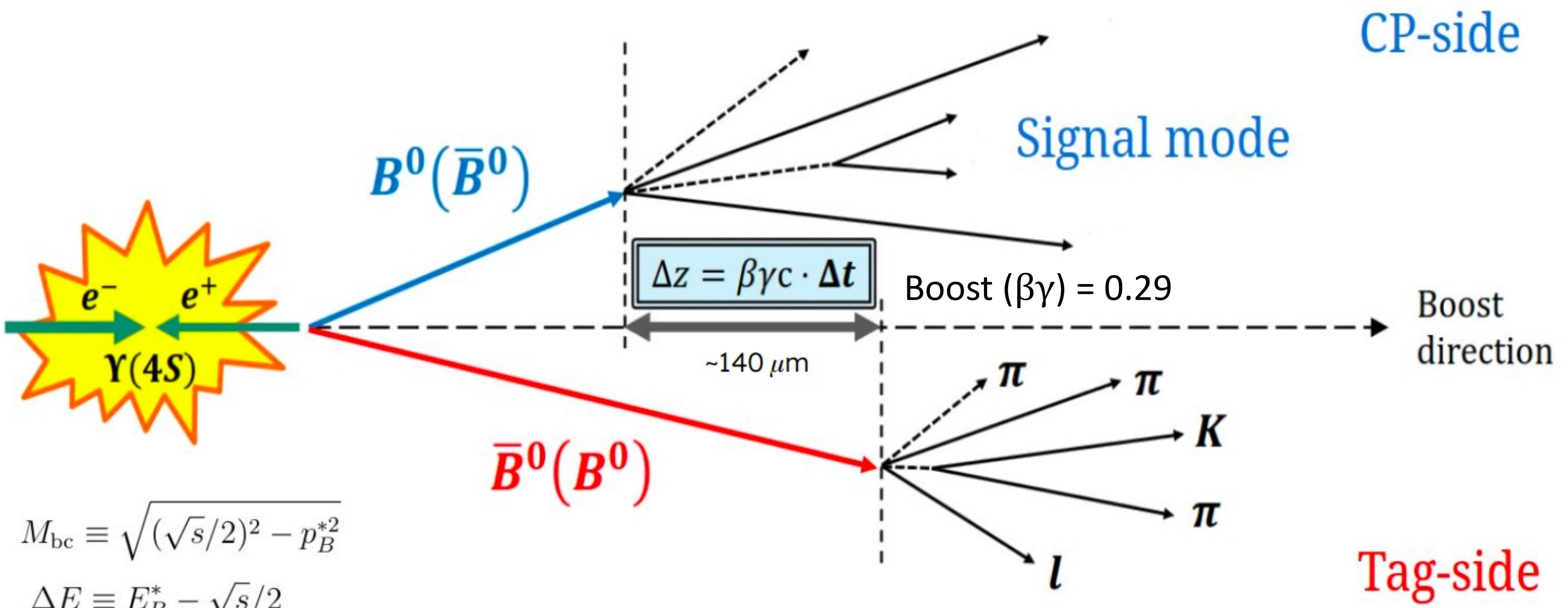
τ physics

Hadronic, leptonic, and semi-leptonic B decays

Strategy for CP measurements

$B\overline{B}$-pair entanglement → B-meson flavour is opposite to its pair at time of decay, then oscillates in time.

$$\mathcal{A}_{CP} = \frac{\Gamma(\overline{B}^0 \to f_{CP}) - \Gamma(B^0 \to f_{CP})}{\Gamma(\overline{B}^0 \to f_{CP}) + \Gamma(B^0 \to f_{CP})}$$



$$M_{bc} \equiv \sqrt{(\sqrt{s}/2)^2 - p_B^{*2}}$$

$$\Delta E \equiv E_B^* - \sqrt{s}/2$$

All results today involve hadronic tagging, except for $R(D^{(*+)})$ and $B \to K\nu\bar{\nu}$.

$B^0 \to \rho^+\rho^-$

[arXiv: 2412.19624]

Goal: Branching fraction ($\mathcal{B}$), polarisation (f_L), CP asymmetry (S and C), ϕ_2 measurement

This decay gives stringent constraints of ϕ_2 due to small contribution from loop amplitude (b→d).

Probability distribution

Mixing-induced CPV param.

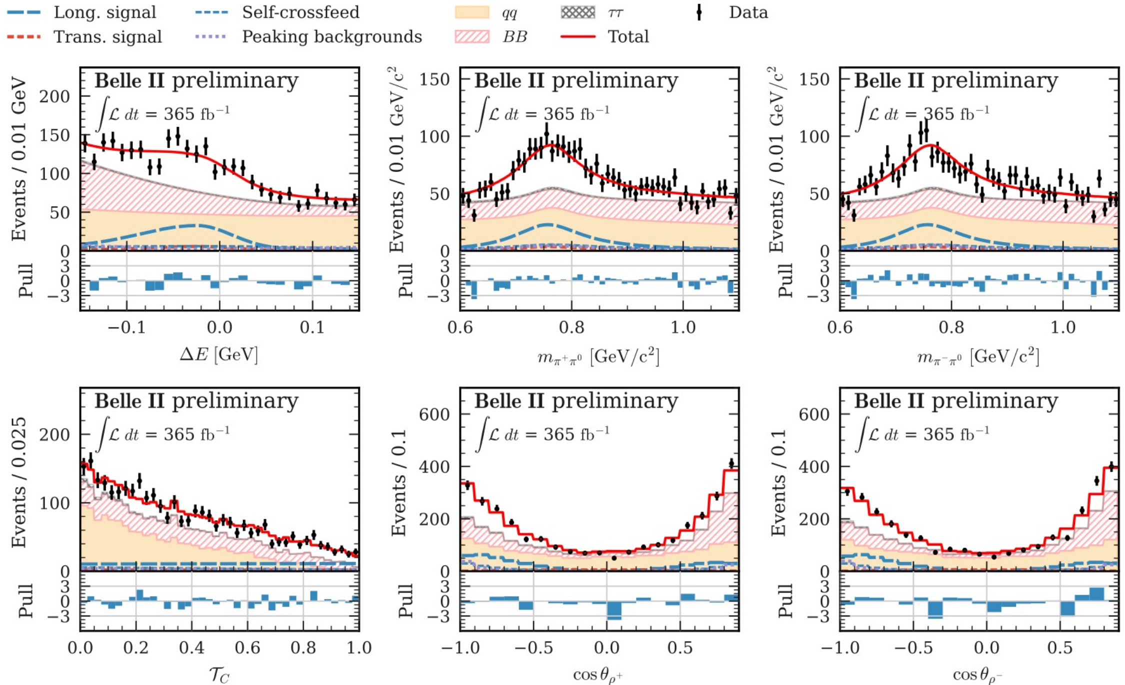
$$P(\Delta t, q) = \frac{e^{-|\Delta t|/\tau_{B^0}}}{4\tau_{B^0}}\Big\{1 + q\big[S\sin(\Delta m_d \Delta t) - C\cos(\Delta m_d \Delta t)\big]\Big\},$$

Direct CPV param.

Helicity angle distribution

Longitudinal polarisation fraction

$$\frac{1}{\Gamma}\frac{d^2\Gamma}{d\cos\theta_{\rho^+}\, d\cos\theta_{\rho^-}} = \frac{9}{4}\Big[\frac{1}{4}(1-f_L)\sin^2\theta_{\rho^+}\sin^2\theta_{\rho^-} + f_L\cos^2\theta_{\rho^+}\cos^2\theta_{\rho^-}\Big],$$



Extend ML fit to 6 obs: ΔE, $m_{\pi^\pm\pi^0}$, $\mathcal{T}_C$, and $\cos\theta_{\rho^+}$ to **extract $\mathcal{B}$ and f_L**

Results (Preliminary)

$$\mathcal{B}(B^0 \to \rho^+\rho^-) = (2.88^{+0.23}_{-0.22}\,{}^{+0.29}_{-0.27}) \times 10^{-5}$$

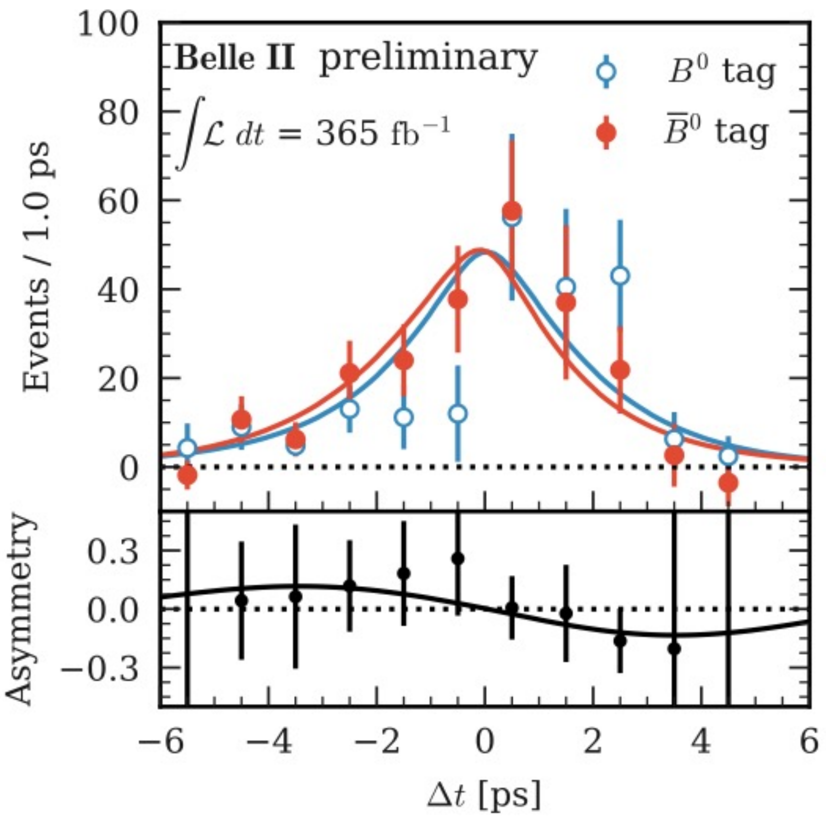
$$f_L = 0.921^{+0.024}_{-0.025}\,{}^{+0.017}_{-0.015}$$

$B^0 \to \rho^+\rho^-$

[arXiv: 2412.19624]

$$\frac{1}{\sqrt{2}}A_{+-} + A_{00} = A_{+0}$$
$$\frac{1}{\sqrt{2}}\bar{A}_{+-} + \bar{A}_{00} = \bar{A}_{-0}$$

Extend ML fit to Δt to extract *S* and *C*:



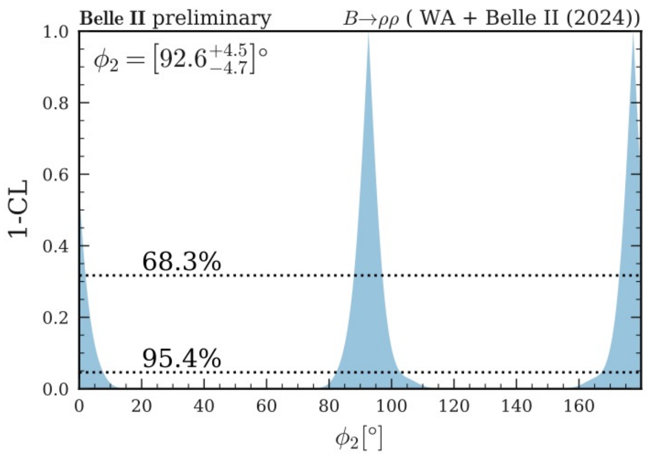
$$S = -0.26 \pm 0.19 \pm 0.08$$
$$C = -0.02 \pm 0.12 \pm 0.05$$

Constraining ϕ_2

- Perform isospin analysis based on the amplitude of longitudinally polarized $B \to \rho^i \rho^j$, A_{ij}
- Constrain using this measurement + World Averages (BaBar, Belle, and LHCb)

$$\phi_2 = (\ 91.5\ ^{+4.8}_{-5.2}\ )^\circ$$

Dominated by systematics from *S*



Second solution of ϕ_2 excluded by ϕ_1 and ϕ_3 measurements

Good agreement with previous BaBar (2007) and Belle (2016) with equivalent BaBar and ~50% of Belle equivalent luminosity !

Search for $B^+ \to \tau^+ \nu_\tau$

[arXiv: 2502.04885]

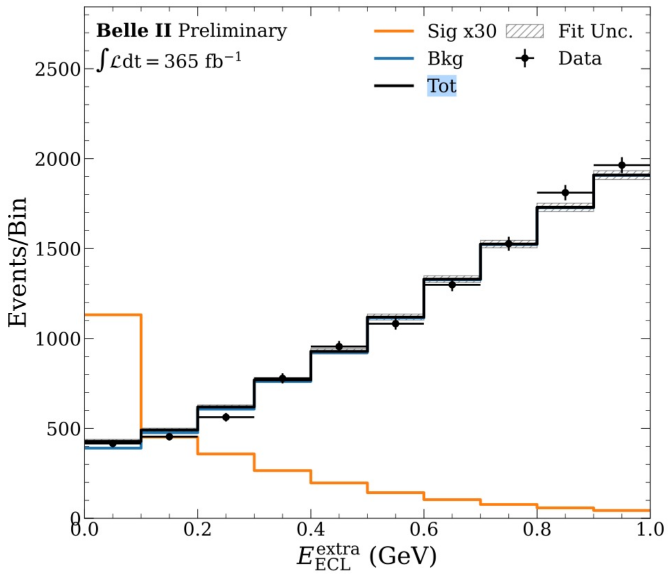
- **Precise BF value is important to check consistency with SM predictions / constrain new physics**

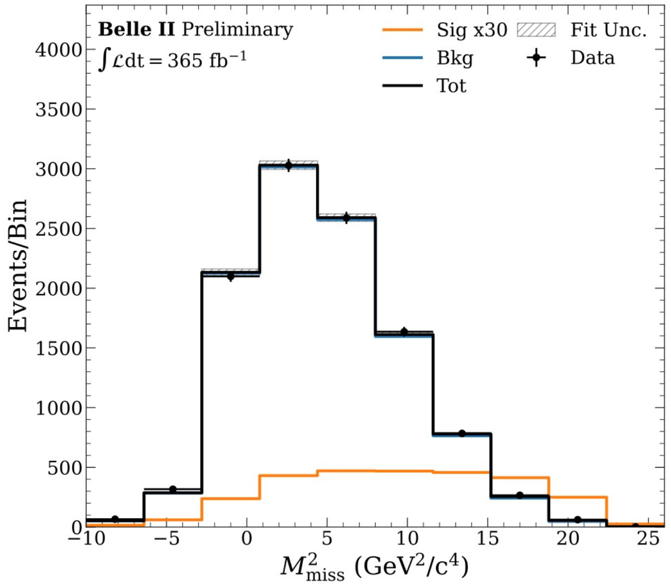
$$\mathcal{B}(B \to \tau\nu) > \mathcal{B}(B \to \mu\nu) > \mathcal{B}(B \to e\nu)$$

- **Potential modes to precisely measure $|V_{ub}|$**
- **Challenging (particularly, τ mode) due to undetected neutrinos in the final state**

Validate simulations/efficiency/modelling using control channels $B \to X\ell\nu$, $B \to D^{(*)}\pi$, and $B \to D^{*0}\ell\nu_\ell$, then

Simultaneous **binned** ML 2D fit to M^2_{miss}, $E^{\text{extra}}_{\text{ECL}}$

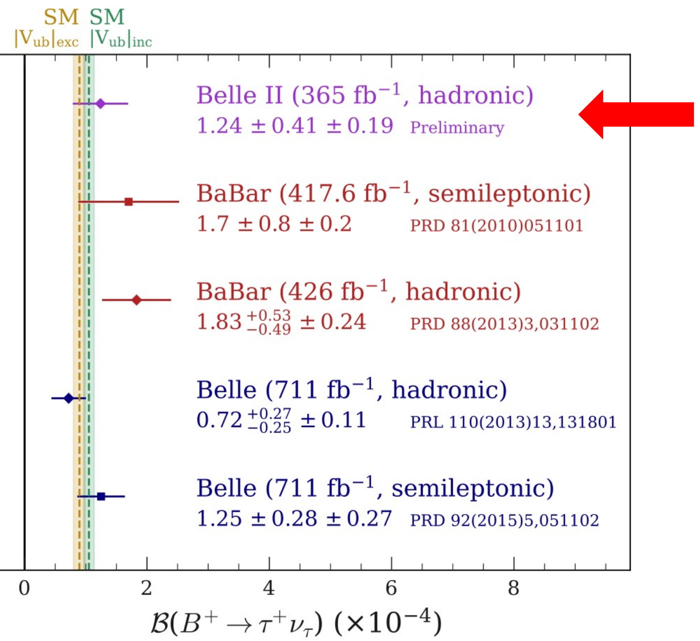




Results (Preliminary)

3σ significance

$$\mathcal{B}(B^+ \to \tau^+\nu) = (1.24 \pm 0.41 \pm 0.19) \times 10^{-4}$$



$\mathcal{R}(D)$ and $\mathcal{R}(D^*)$

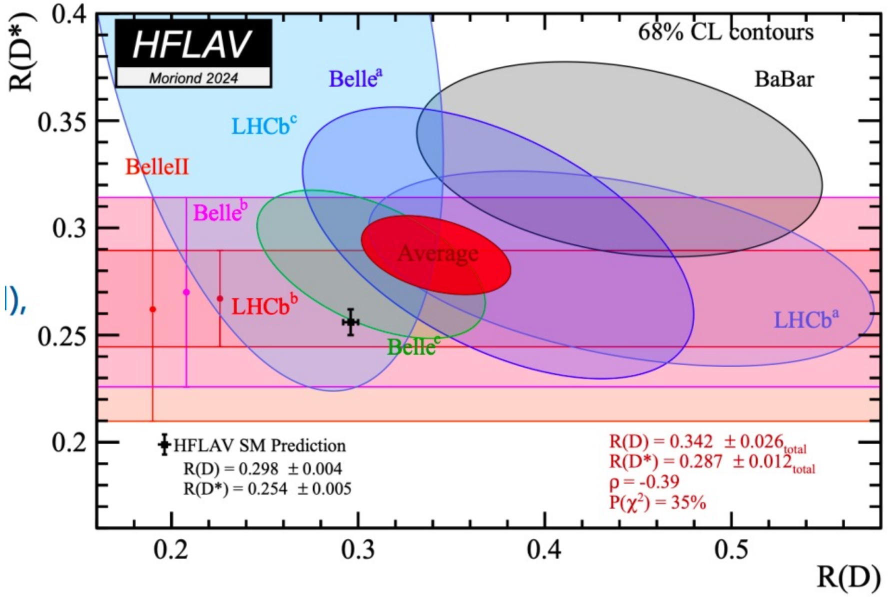
$$\mathcal{R}(D^{(*)+}) = \frac{\mathcal{B}(\overline{B}^0 \to D^{(*)+}\tau^-\bar{\nu}_\tau)}{\mathcal{B}(\overline{B}^0 \to D^{(*)+}\ell^-\bar{\nu}_\ell)}$$

- In SM, the W boson couples equally to $\tau, \mu, e \Longrightarrow$ **Lepton-Flavor Universality (LFU)**
- **Ratio measuremnts** provide strigent LFU tests: branching fractions, angular asymmetry, etc.
  - Normalization ($|V_{xb}|$) cancels
  - Part of theoretical, experimental uncertainties cancels

Goal: $\mathcal{R}(D^+)$ and $\mathcal{R}(D^{*+})$ measurement using semi-leptonic tagged approach (First results)

Reconstruction:

- Use semi-leptonic FEI to reconstruct the B_{tag}
- B_{sig} is reconstructed from $D^{(*)}$, leptons, and leptonic τ decays



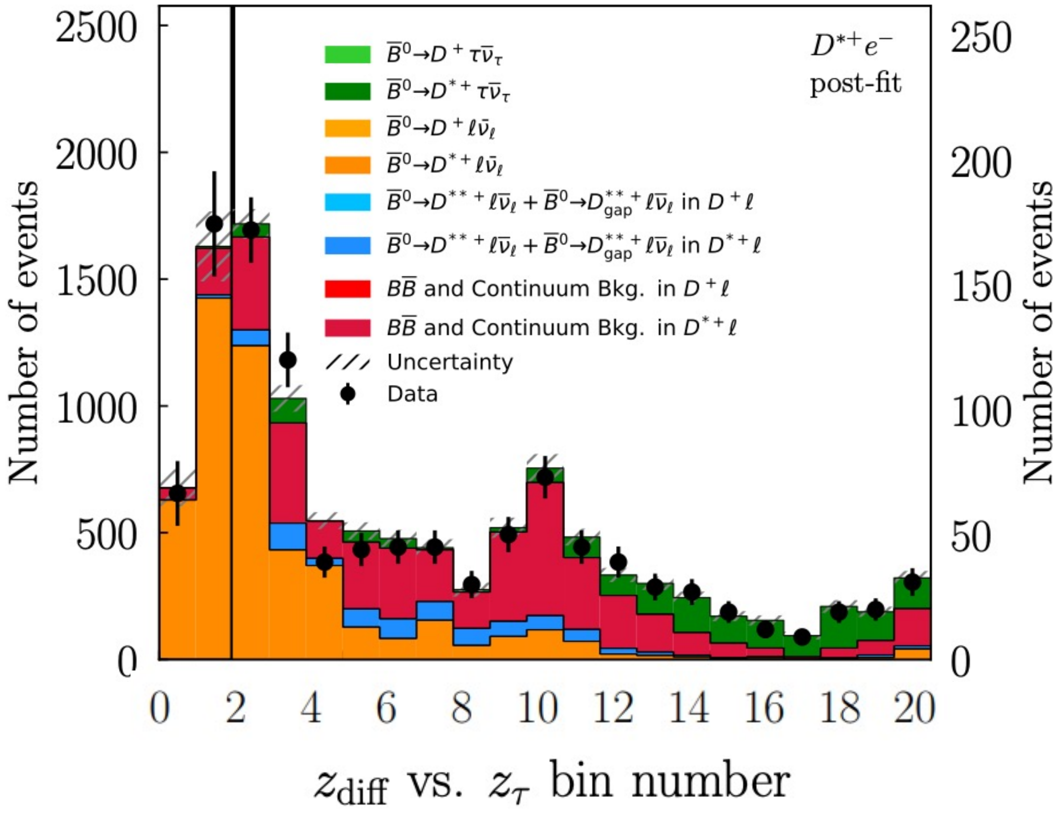
Combined deviation from SM stands at 3.3σ

$\mathcal{R}(\mathrm{D})$ and $\mathcal{R}(\mathrm{D}^*)$

[arXiv: 2504.11220]

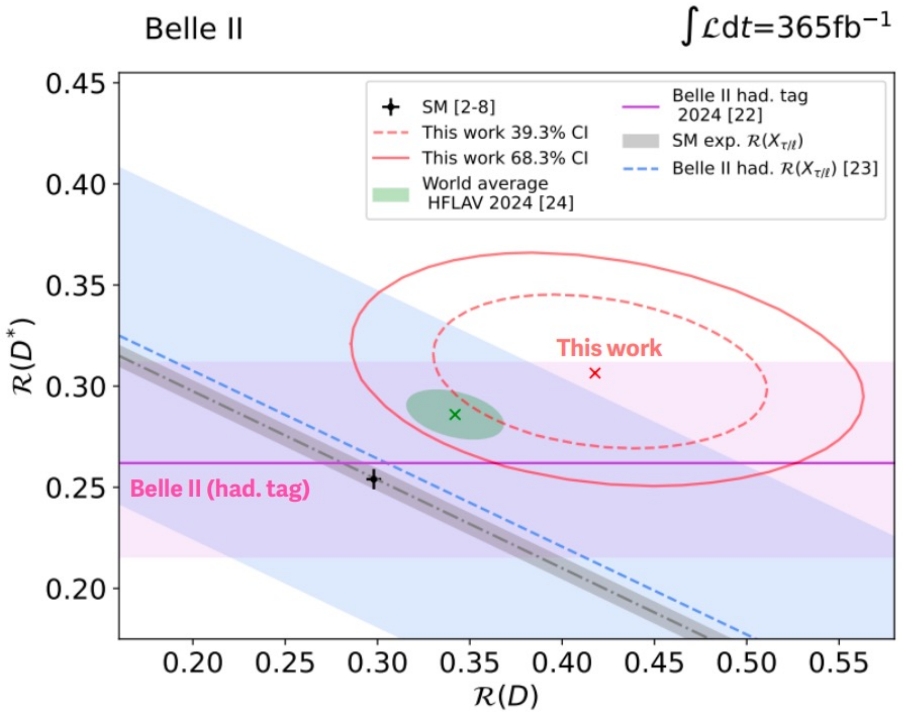
Signal extraction

- 2D binned log-likelihood fit to z_τ and $z_{\mathrm{diff}} = z_\ell - z_{\mathrm{bkg}}$
- The three classification scores are denoted as z_τ, z_ℓ, and z_{bkg} for semitauonic, semileptonic, and background events, respectively.
- Input BDT variables: angular, momenta of ℓ and $D^{(*)}$, and E_{ECL} extra.



Results (Preliminary)

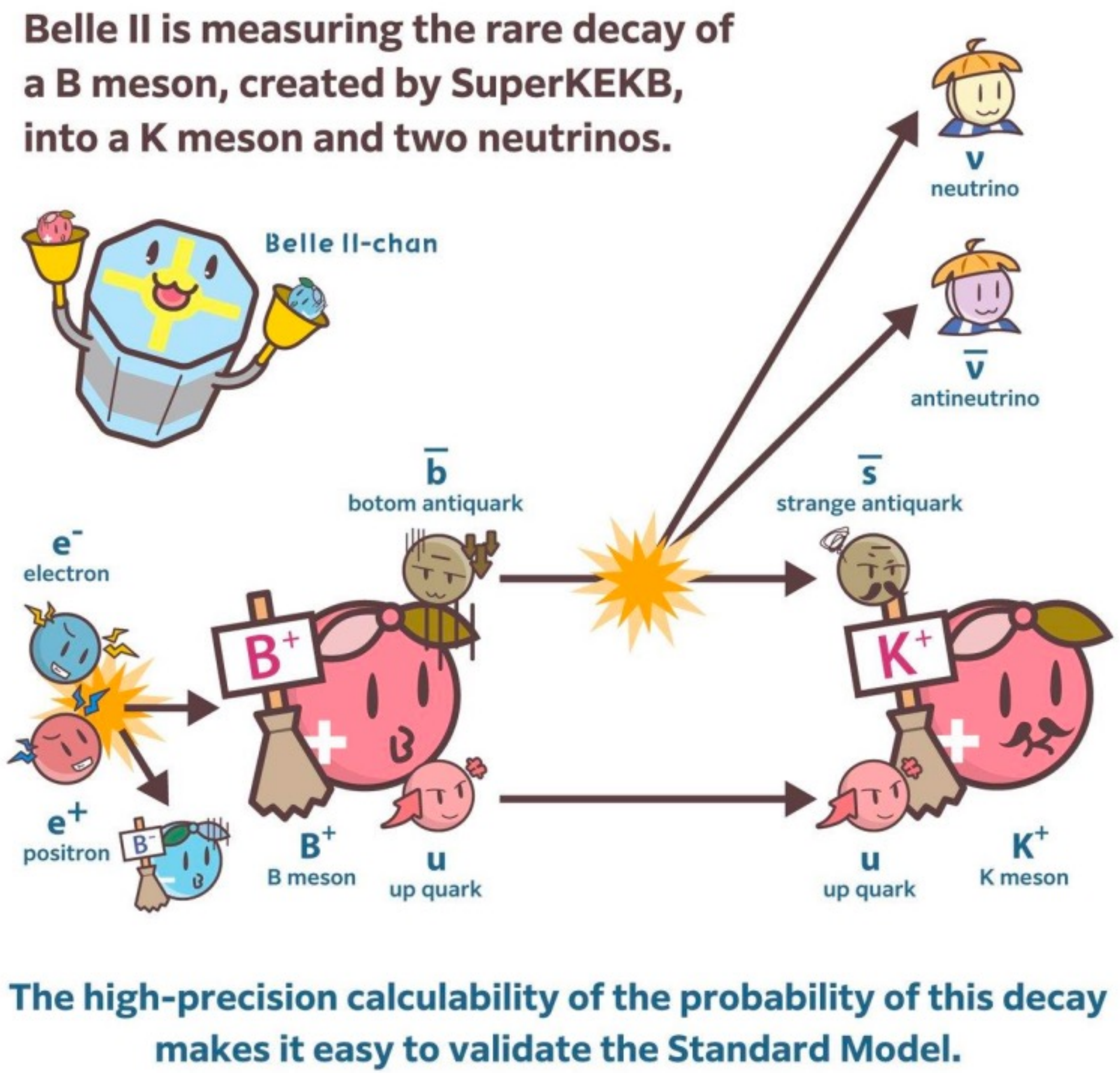
$$\mathcal{R}(D^+) = 0.418 \pm 0.074\ (\mathrm{stat}) \pm 0.051\ (\mathrm{syst})$$
$$\mathcal{R}(D^{*+}) = 0.306 \pm 0.034\ (\mathrm{stat}) \pm 0.018\ (\mathrm{syst})$$

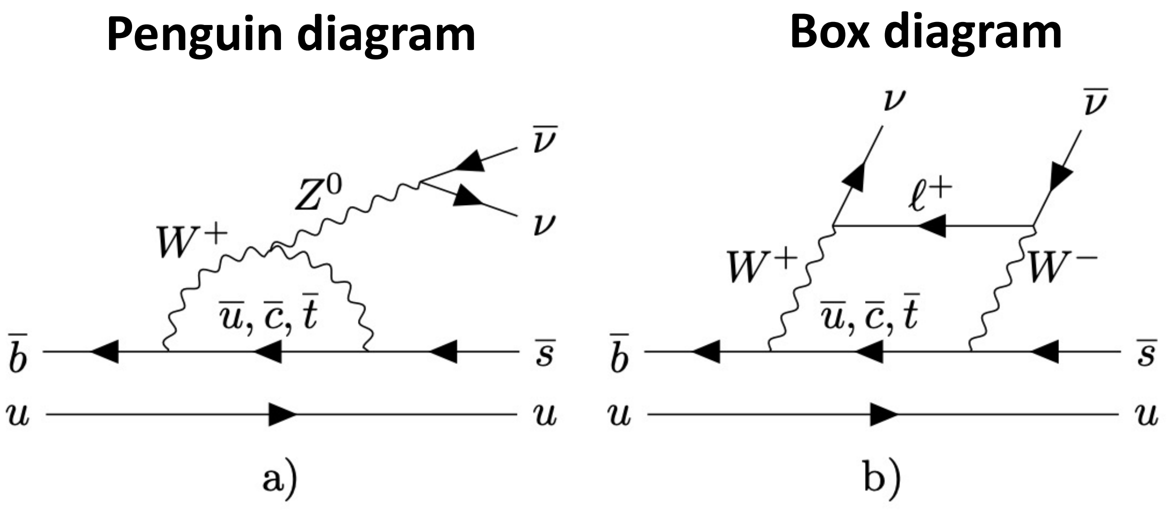


- Results are compatible with SM within 1.7σ

rare B decays

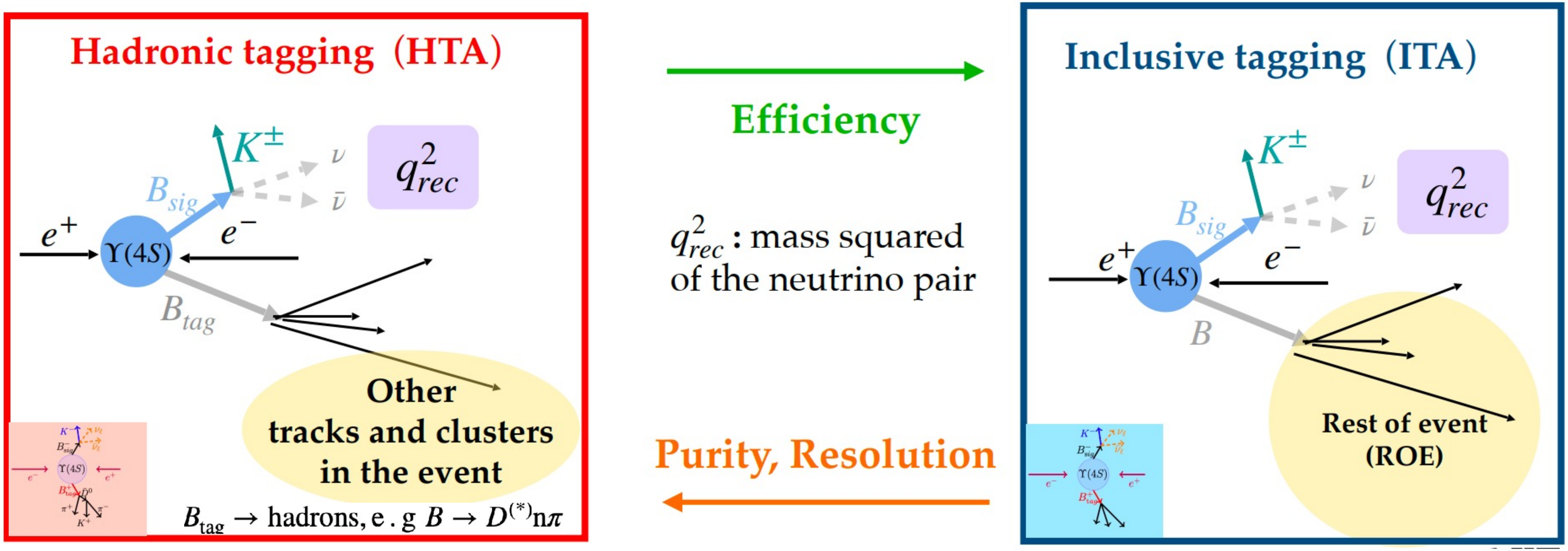
$B \to K\nu\bar{\nu}$





- **The process is known with high accuracy in the SM: $\mathcal{B}(\mathrm{B} \to \mathrm{K}\nu\bar{\nu}) = (5.6 \pm 0.4) \times 10^{-6}$ [PRD 107, 014511 (2023)]**
- **Extensions beyond SM may lead to significant rate increase.**
- **Very challenging experimentally, not yet observed**

Two ways of tagging



- *New technique* from Belle II with inclusive ROE (Rest of Event) tagging (× 10−20 efficiency, but large backgrounds)
- Add some ML/AI (boosted decision trees or BDTs) to help suppress the large backgrounds.

First evidence for $B \to K\nu\bar{\nu}$

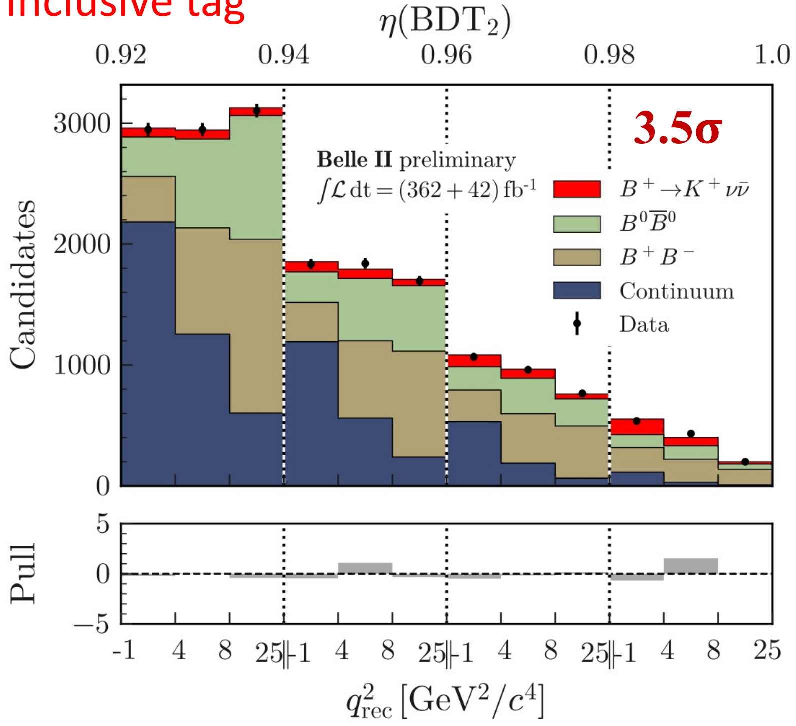
[PRD 109, 112006 (2024)]

- Extract signal from maximum likelihood fit
  - Inclusive tag: in bins of q^2_{rec} and $\eta(\mathrm{BDT}_2)$
  - Hadronic tag: in bins of $\eta(\mathrm{BDT_h})$

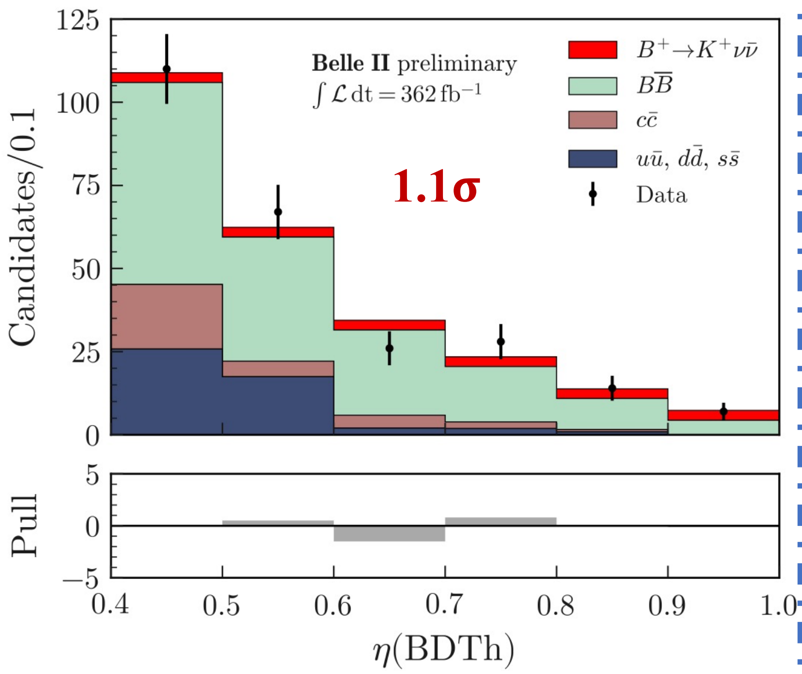
$$\mathcal{B}(B \to K\nu\bar{\nu}) = (2.7 \pm 0.5(\mathrm{stat}) \pm 0.5(\mathrm{syst}))\times 10^{-5}$$ **(inclusive tag)**

$$\mathcal{B}(B \to K\nu\bar{\nu}) = (1.1^{+0.9}_{-0.8}(\mathrm{stat})^{+0.8}_{-0.5}(\mathrm{syst}))\times 10^{-5}$$ **(hadronic tag)**

Inclusive tag



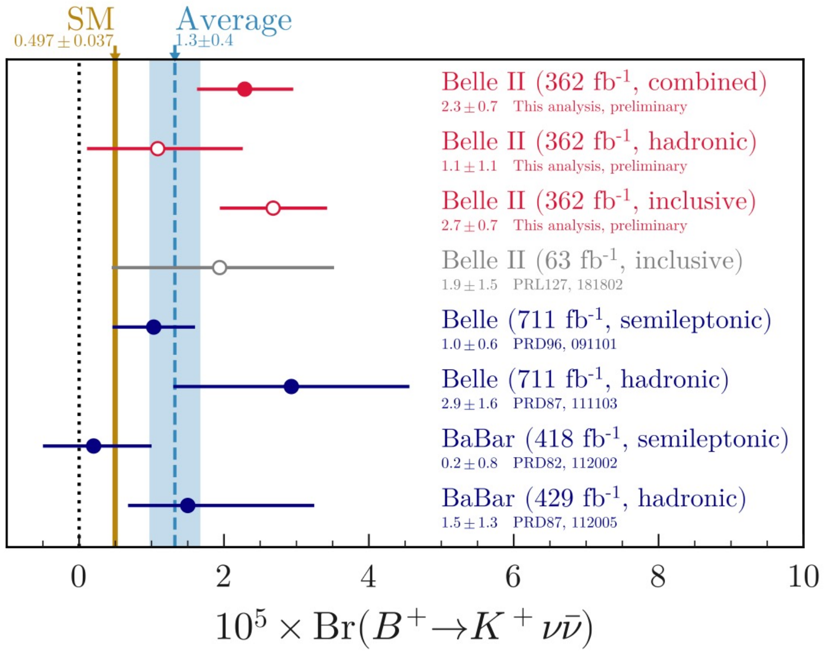
Hadronic tag



Combination and comparisons with other measurements:

$$\mathcal{B}(B \to K\nu\bar{\nu}) = (2.3 \pm 0.7)\times 10^{-5}$$

Significance: 3.5σ

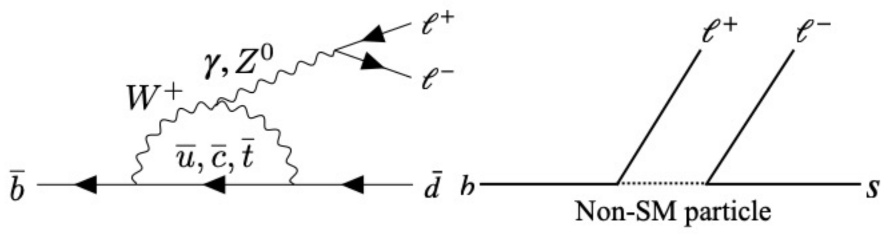


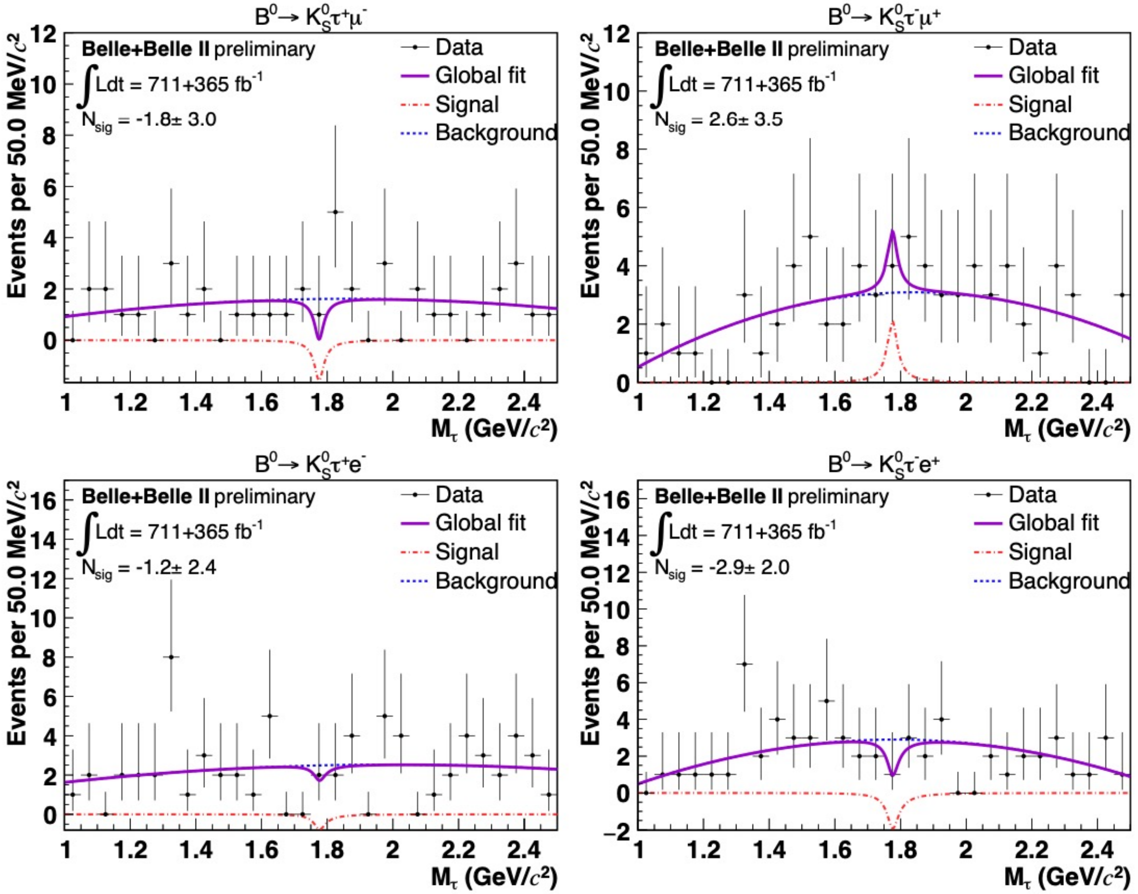
The signal is **2.7σ** above the SM expectation.

Search for $B^0 \to K_s^0 \tau^\pm \ell^\mp$

[arXiv: 2412.16470]

- Flavor changing neutral current processes are forbidden in SM at tree level.
- NP models that accommodate the $b \to c\tau\ell$ anomalies predict an enhancement of several orders of magnitude with τ.
- Never searched for before
- High K_s^0 purity (>98%)
- Search in 1-prong τ decays: $\tau^+ \to \ell^+ \nu\bar{\nu}, \pi^+\nu, \rho^+\nu$
- Fit recoil τ mass (M_τ) for signal extraction





$$
\begin{aligned}
\mathscr{B}(B^0 \to K_S^0\tau^+\mu^-) &< 1.1\times10^{-5}\\
\mathscr{B}(B^0 \to K_S^0\tau^-\mu^+) &< 3.6\times10^{-5}\\
\mathscr{B}(B^0 \to K_S^0\tau^+e^-) &< 1.5\times10^{-5}\\
\mathscr{B}(B^0 \to K_S^0\tau^-e^+) &< 0.8\times10^{-5}
\end{aligned}
$$

at 90% CL

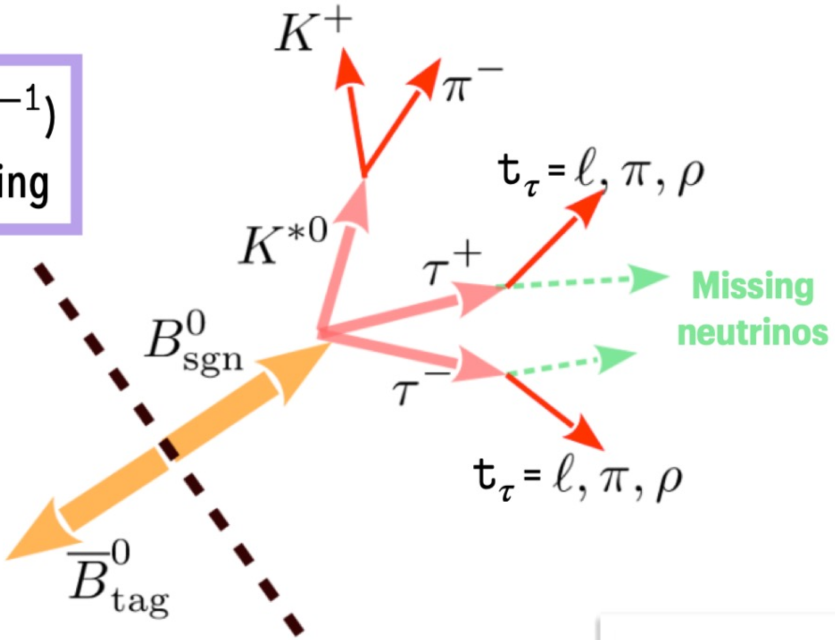
First search for $B^0 \to K_s^0\tau^\pm\ell^\mp$ decays

Search for $B^0 \to K^{*0}\tau^+\tau^-$

[arXiv: 2504.10042]

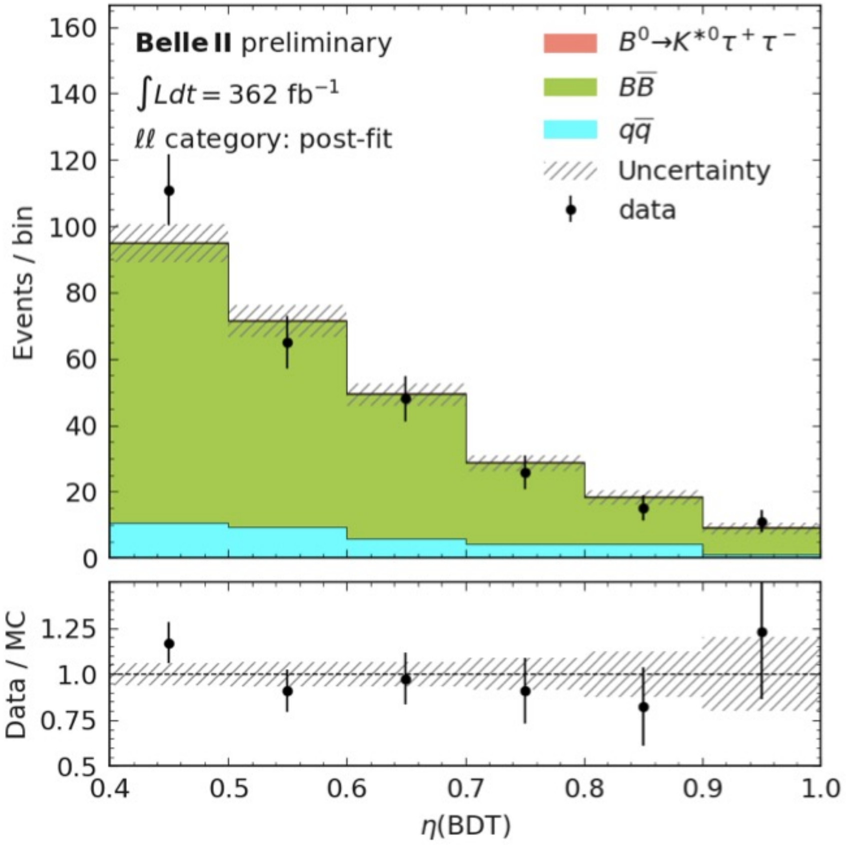
- Non-SM particles, explaining recent anomalies, would enhance BF upto $\mathcal{O}(10^3)$ due to presence of two τs
- Main challenge: no signal peaking kinematic observable due to multiple undetected neutrinos
- Relies on missing energy information and residual calorimeter energy; Belle II is ideally suited

Belle II (364 fb^{-1})
hadronic B-tagging



Combinations of sub-track from τ lead to 4 categories: $\ell\ell$, $\ell\pi$, $\pi\pi$, ρX

BDT is trained using missing energy, extra cluster energy in EM calorimeter, $M(K^{*0}t_\tau)$, q^2,etc



$\mathcal{B}^{\rm UL} = 1.8 \times 10^{-3}$ at 90% confidence level

Twice better with only half sample wrt Belle!
Better tagging + more categories + BDT classifer...

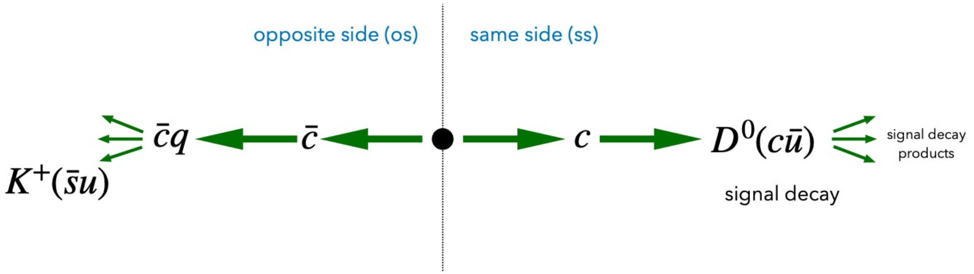
The most stringent limit on the $B^0 \to K^{*0}\tau^+\tau^-$ decay

charm

A_{CP} in $D^0 \to K_S^0 K_S^0$

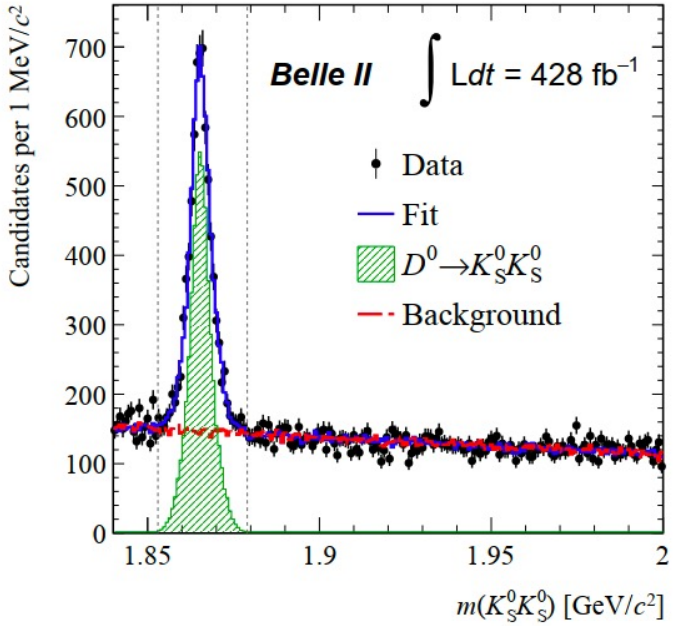
Charm-flavor-tag (CFT) D^0: exploits the correlation between the flavor of a D^0 meson and the electric charges of particles reconstructed in the rest of the $e^+e^- \to c\bar{c}$ event [PRD 107, 112010 (2023)].

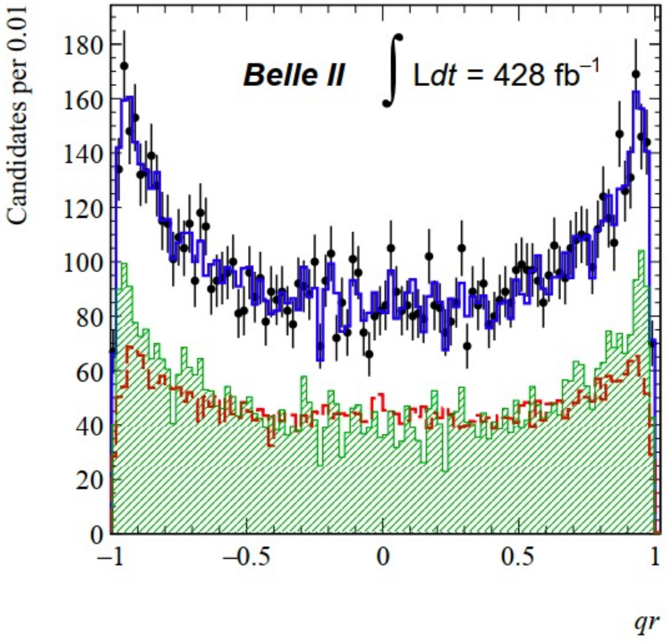
CFT-tag



Double the size of sample compered to D^*-tag

Fit $\mathrm{m}(\mathrm{K}_S^0\mathrm{K}_S^0)$ and product of tagged flavor q and tag quality r:





[Preliminary results]

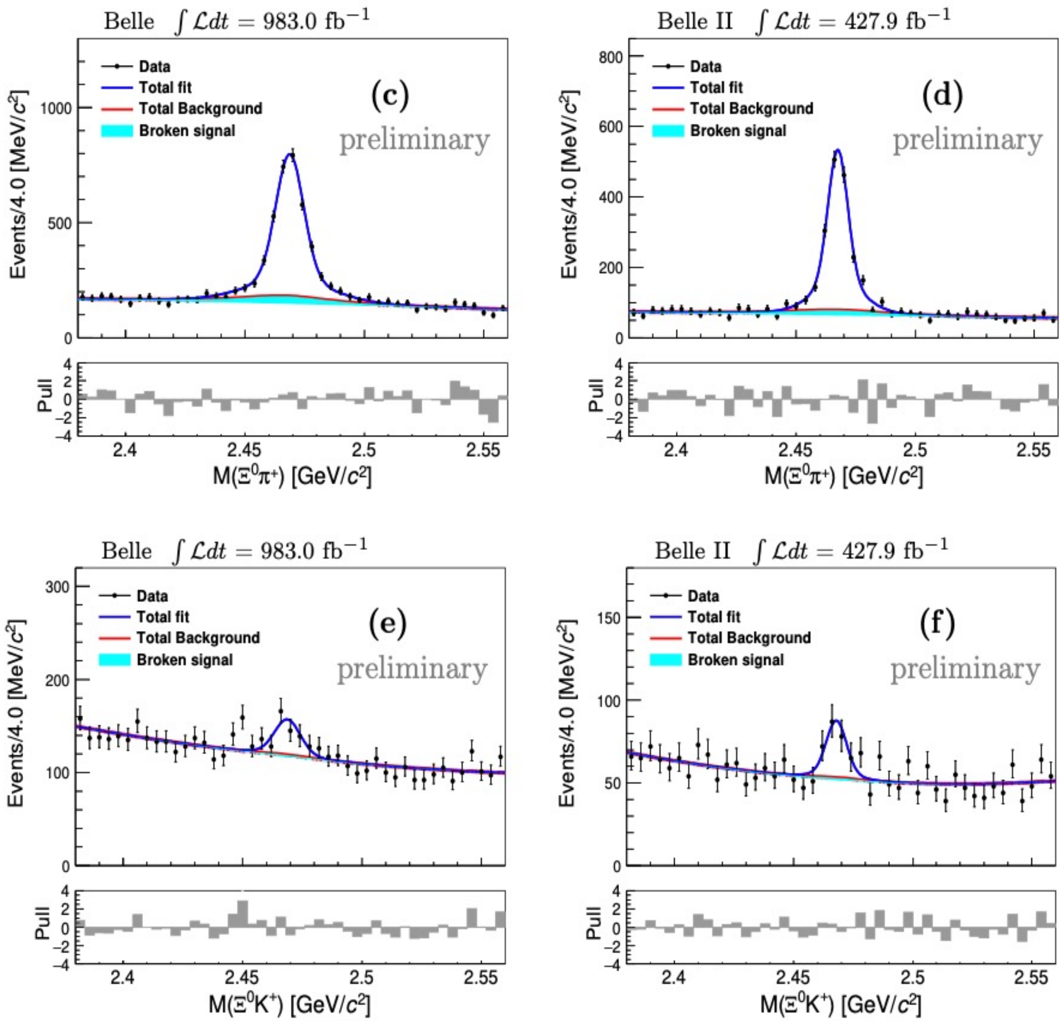
Method	A_{CP} [%]
D^*-tag [PRD 111, 012015]	$-1.4 \pm 1.3 \pm 0.1$
CFT-tag	$1.3 \pm 2.0 \pm 0.3$
Combination	$\mathbf{-0.6 \pm 1.1 \pm 0.1}$

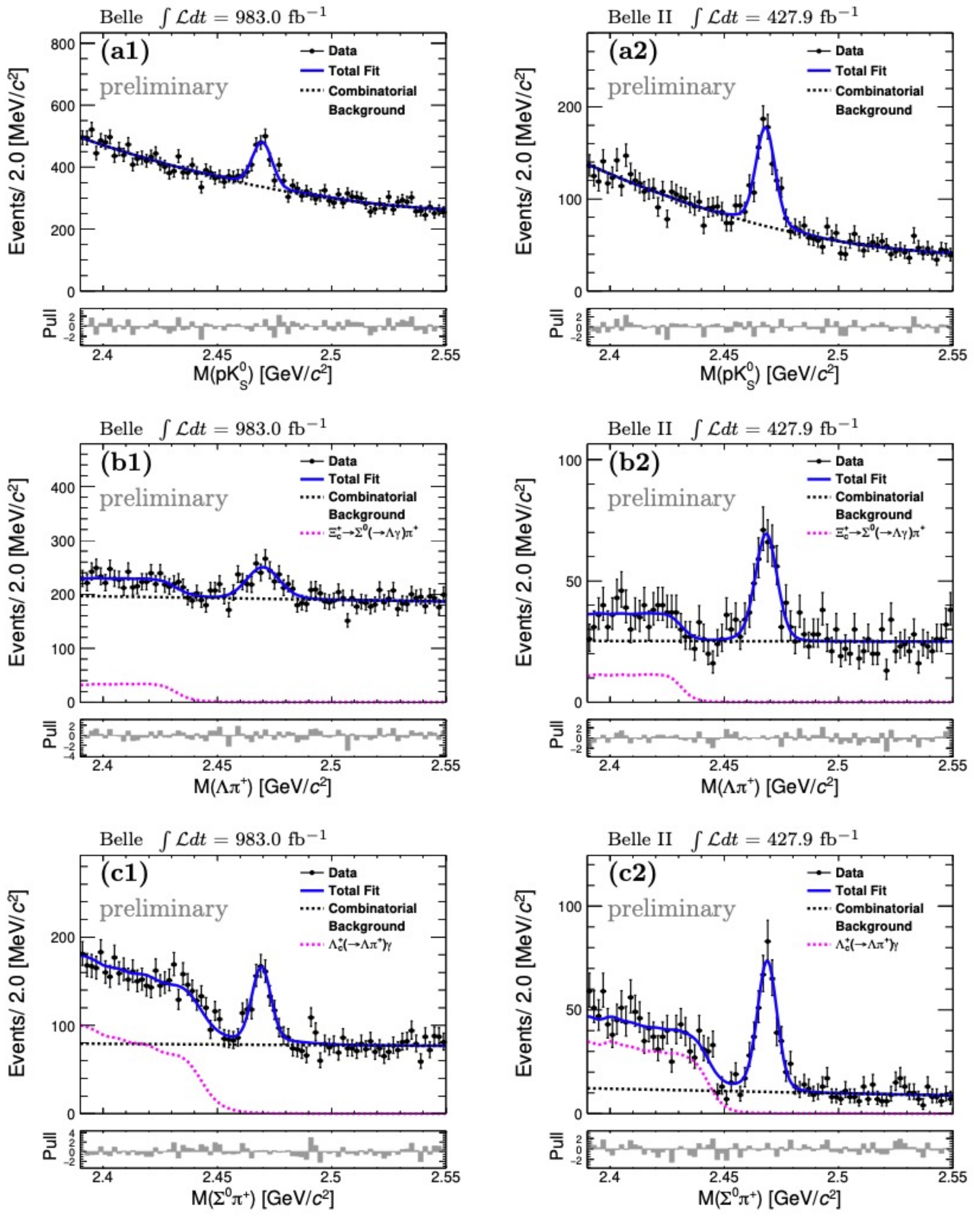
World’s best determination!

Ξ_c^+ branching fractions

$e^+e^- \to \Xi_c^+$ + anything

Reconstruct
- $\Xi_c^+ \to \Sigma^+ K_S^0$, $\Xi_c^+ \to \Xi^0 \pi^+$ (CF)
- $\Xi_c^+ \to \Xi^0 K^+$, $\Xi_c^+ \to p K_S^0$, $\Xi_c^+ \to \Lambda \pi^+$, $\Xi_c^+ \to \Sigma^0 \pi^+$ (SCS)

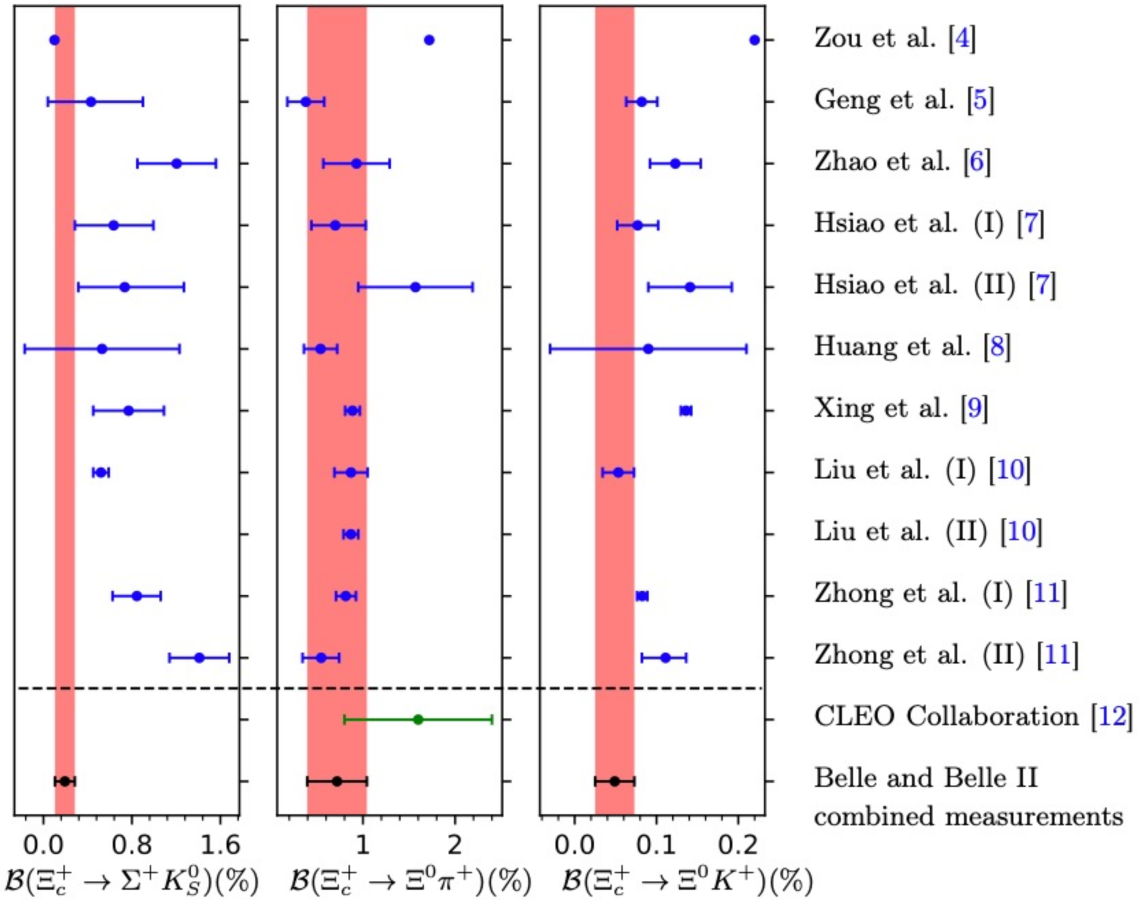




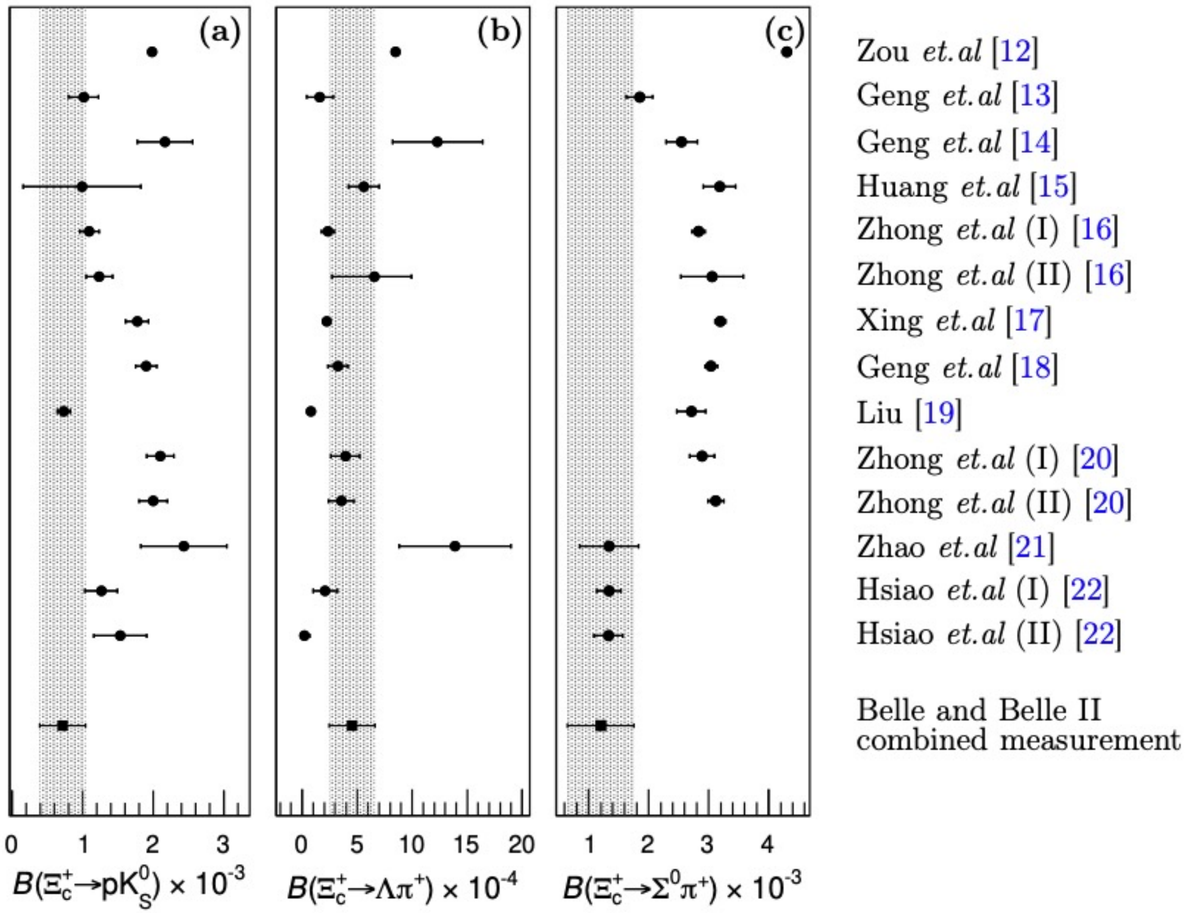
Ξ_c^+ branching fractions

First or most precise measurements!

[Preliminary results]



[JHEP 03 (2025) 061]



quarkoium

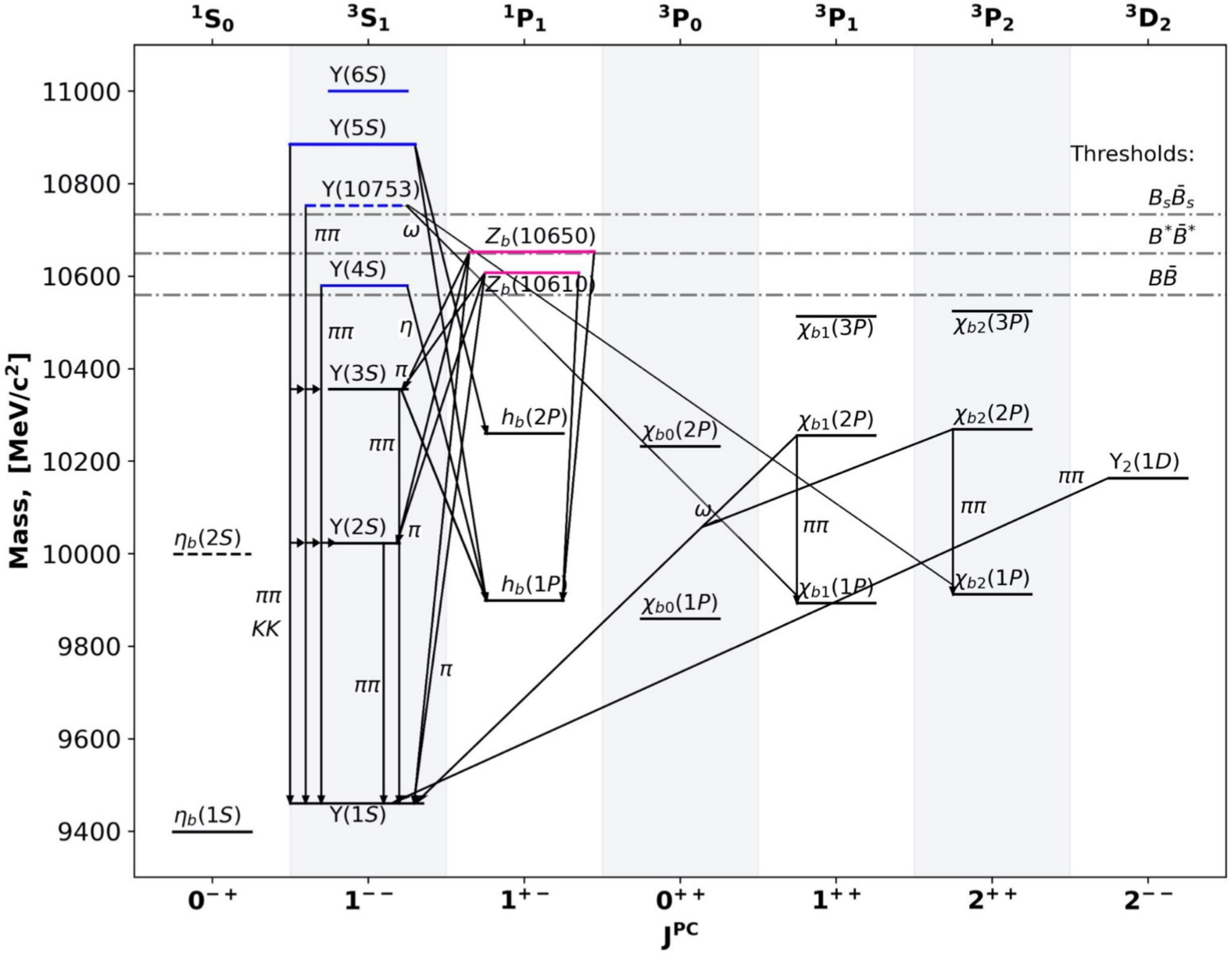
Bottomonium

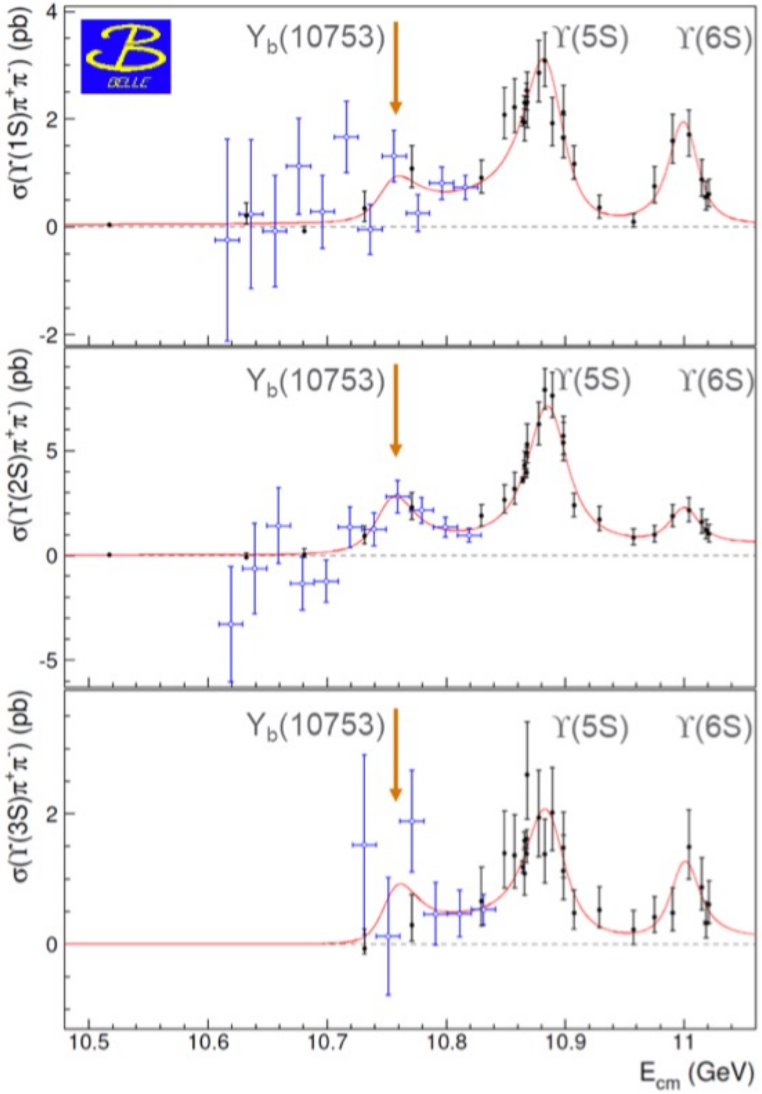
The $\Upsilon(10753)$ was first discovered in $\pi^+\pi^-\Upsilon(nS)$ final states using scan data by Belle [JHEP 10, 220 (2019)].

Conventional bottomonium (pure $b\bar{b}$ states)

Bottomonium-like states (mix of $b\bar{b}$ and $B\bar{B}$)

Exotic charged states (Z_b^+)

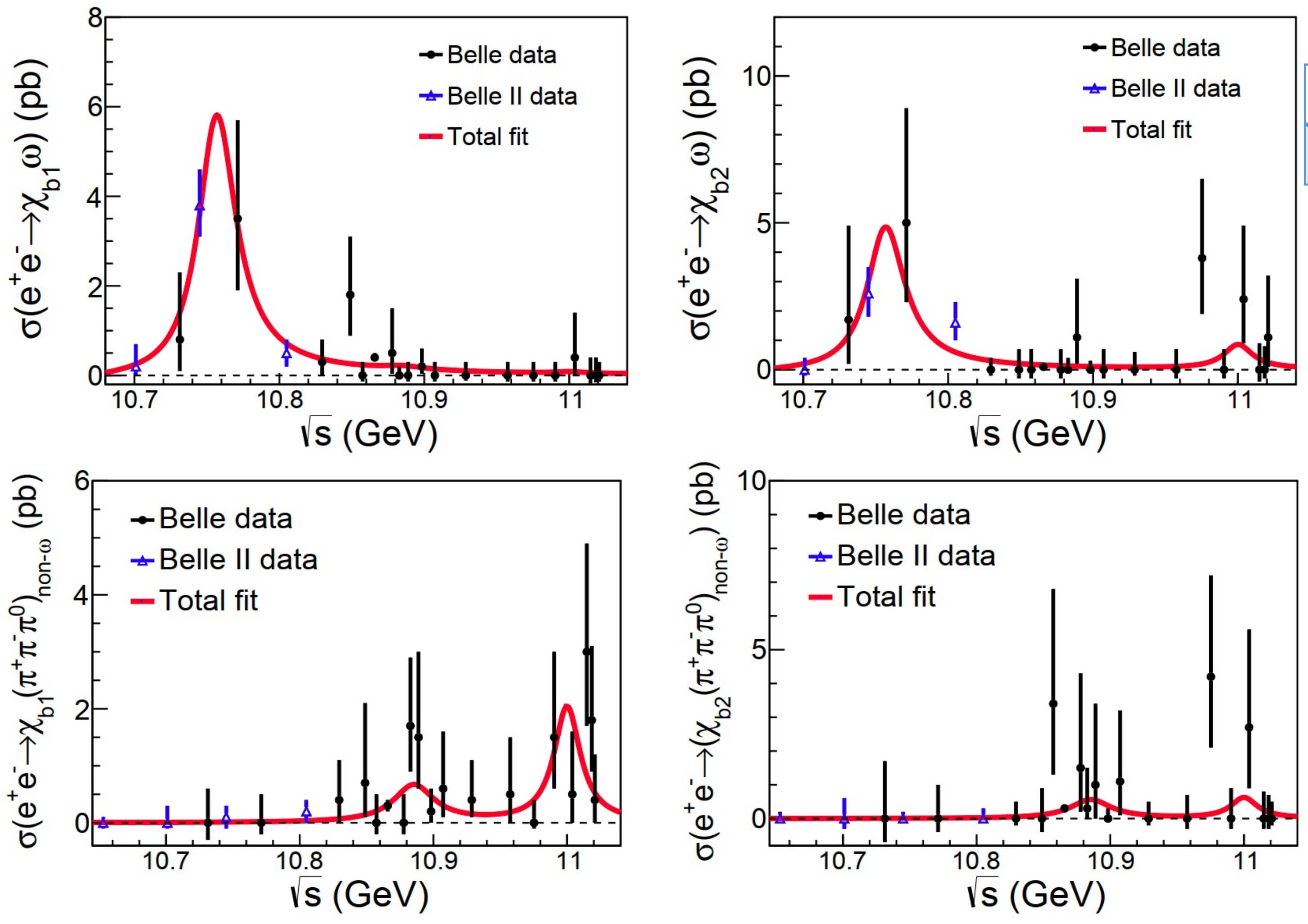




Recently, Belle II collected 19 fb^{-1} of unique data around $\sqrt{s} \sim 10.75$ GeV to study the nature of the $\Upsilon(10753)$.

$e^+e^- \to \omega\chi_{bJ}$ and $e^+e^- \to (\pi^+\pi^-\pi^0)_{non-\omega}\chi_{bJ}$ at Belle and Belle II

[Preliminary results]



$\Upsilon(10753)$ mass	(10756.1 ± 4.3) MeV/c^2
$\Upsilon(10753)$ width	(32.2 ± 18.7) MeV

- The mass and width are consistent with those from $e^+e^- \to \pi^+\pi^-\Upsilon(nS)$ measuremnt [JHEP 07, 116 (2024)].

$$\frac{\sigma(e^+e^-\to\chi_{bJ}(1P)\omega)}{\sigma(e^+e^-\to\Upsilon(nS)\pi^+\pi^-)}$$

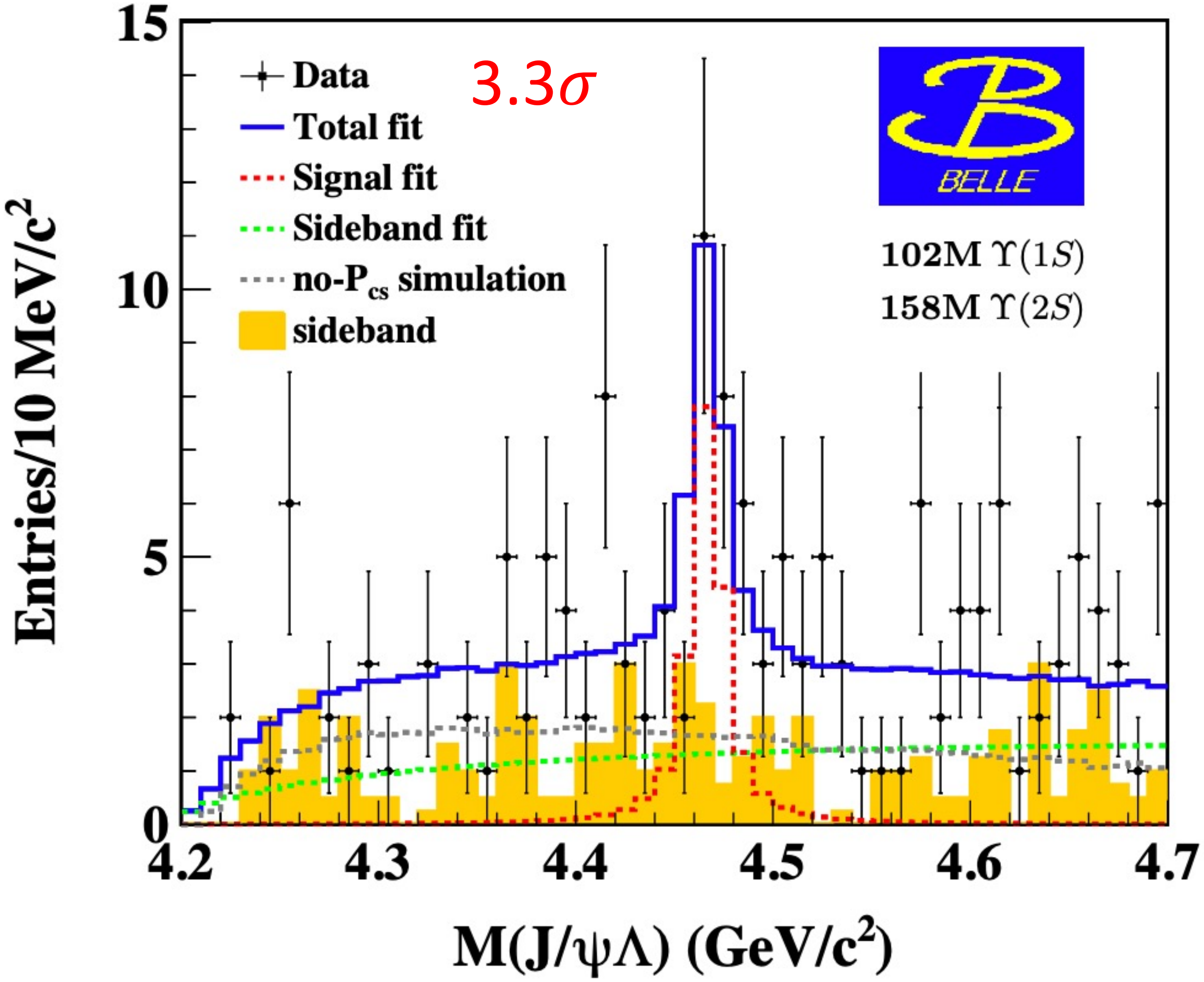
1.5 at $\sqrt{s}\sim 10.75$ GeV **0.15 at $\sqrt{s}\sim 10.867$ GeV**

This may indicate the difference in the internal structures of $\Upsilon(10753)$ and $\Upsilon(10860)$.

- The $(\pi^+\pi^-\pi^0)_{non-\omega}\chi_{bJ}$ excess maybe due the cascade decay of $\Upsilon(10860,11020) \to Z_b\pi \to \chi_{bJ}\rho\pi$ [PRD 90, 014036 (2014)].

Evidence of $P_{c\bar{c}s}(4459)$ at Belle

[arXiv:2502.09951]



- OZI suppressed decays of $\Upsilon(1S)$ and $\Upsilon(2S)$ rich in gluons:
  - enhanced baryon production
  - Pentaquarks?
- Select inclusive $\Upsilon(1S, 2S) \to J/\psi\Lambda + X$ decays, then search for $P_{c\bar{c}s} \to J/\psi\Lambda$ in $M(J/\psi\Lambda)$
- 4.0σ local significance with free mass and width
- 3.3σ significance with the Gaussian constraints from LHCb measurement [Sci. Bull. 66, 1278 (2021)]

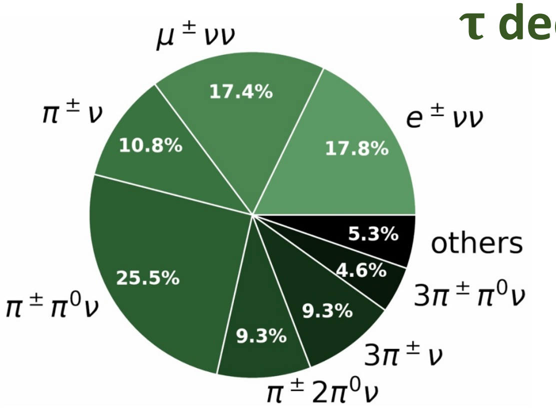
$$-2\ln\mathcal{L} + \frac{(m-m_0)^2}{\sigma^2_{m_0}} + \frac{(\Gamma-\Gamma_0)^2}{\sigma^2_{\Gamma_0}}$$

Tau and dark sector

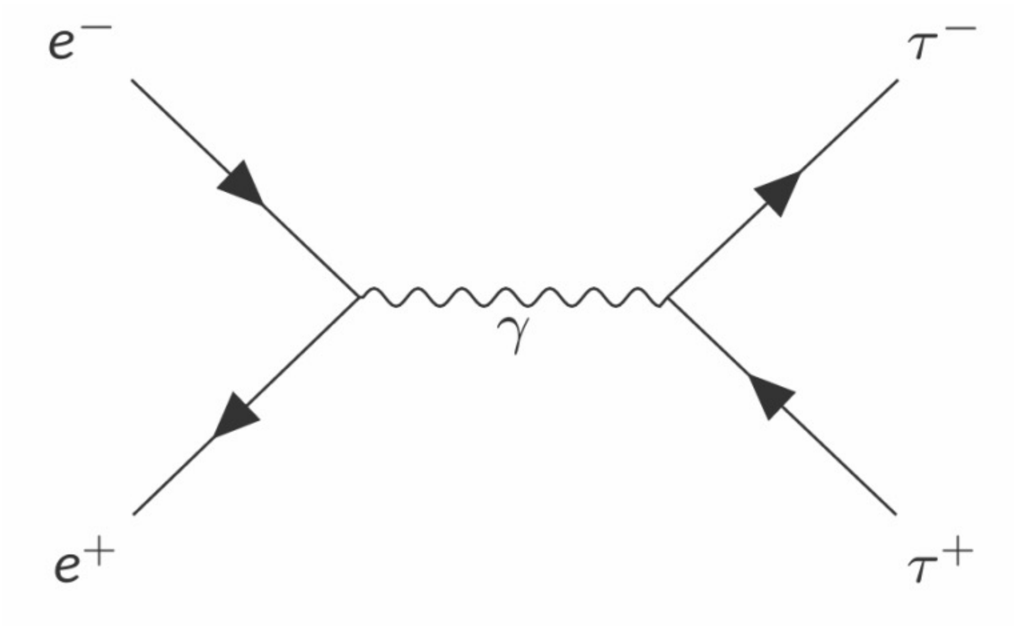
τ physics

SuperKEKB as a ***τ factory***

- e^+e^- collider produce τ lepton pairs at high rate



≫ lepton favour/number violation, CKM unitarity, CP violation, ...



$$\sigma(e^+e^- \to \tau^+\tau^-) = 0.92\ nb$$

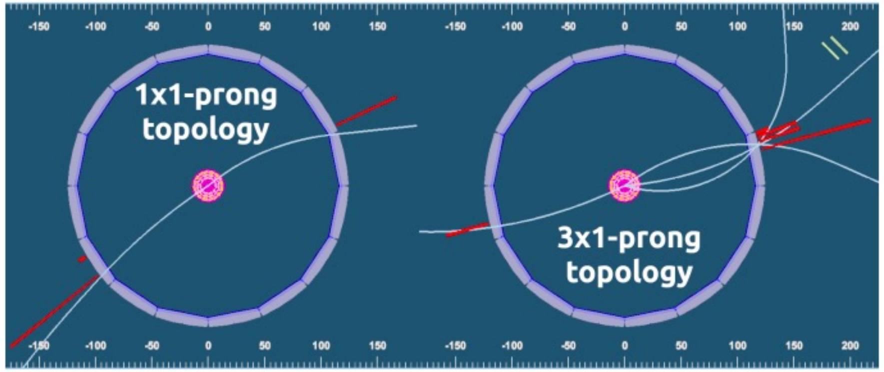
$$\sigma(e^+e^- \to B\bar{B}) = 1.05\ nb$$

Advantages at Belle II:

✓ High luminosity

✓ Good vertexing and tracking capabilities

✓ Sophisticated trigger system and particle ID



Taupair events are produced back-to-back and each tau is reconstructed via 1 or 3 charged tracks.

Lepton-Flavour Violation in τ physics

[Preliminary results]

Lepton flavour violation is only allowed by:

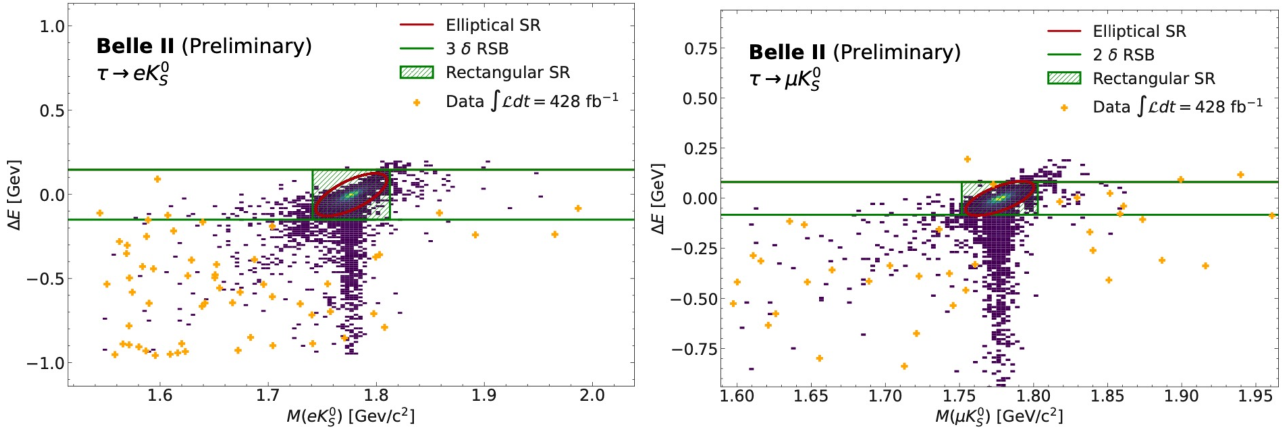
- **Neutrino oscillations** $\mathcal{O}(10^{-55})$

far beyond current experimental sensitivities

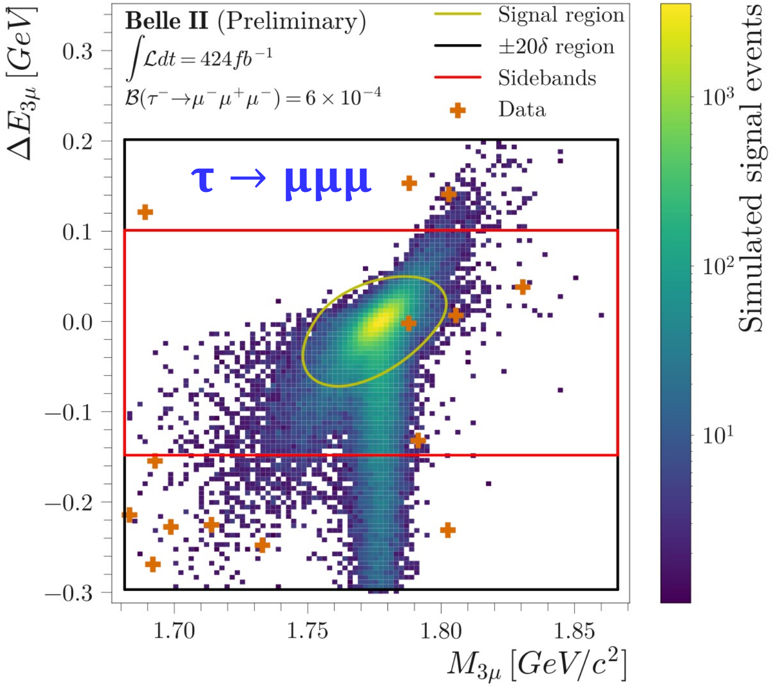
- **New Physics models** $\mathcal{O}(10^{-8})$

e.g. Leptoquarks for $\tau^- \to \ell^- V^0$ deals with $R(K^{*0})$ anomalies

Search for $\tau \to \ell K_s^0$:

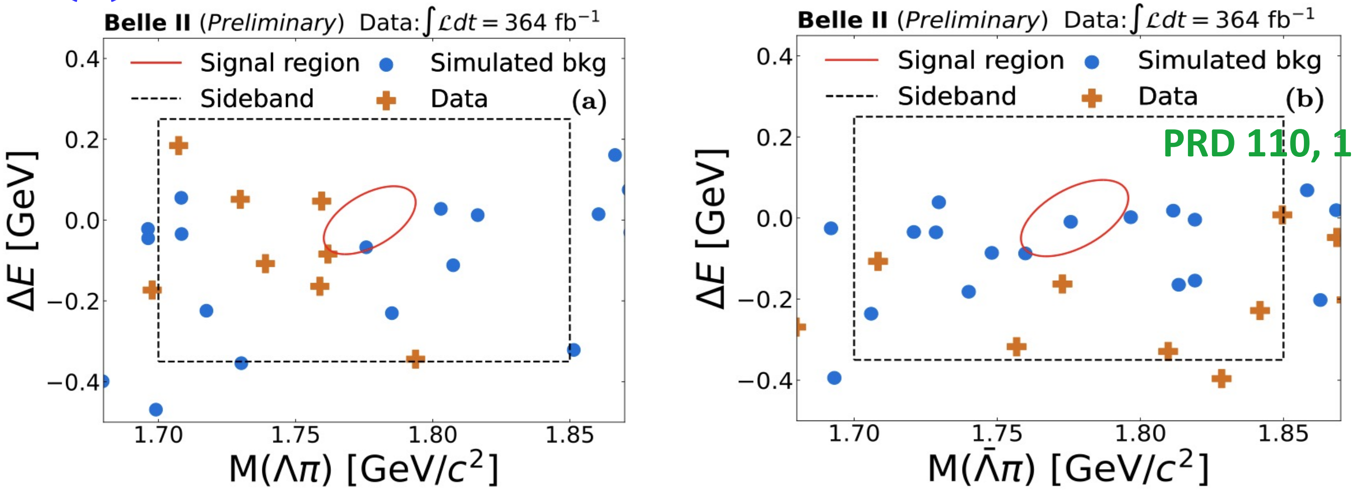


[JHEP 09 (2024) 062]



$$\Delta E_{3\mu} = E_\tau^* - \sqrt{s}/2$$

$\tau^- \to \Lambda(\bar{\Lambda})\pi^-$:



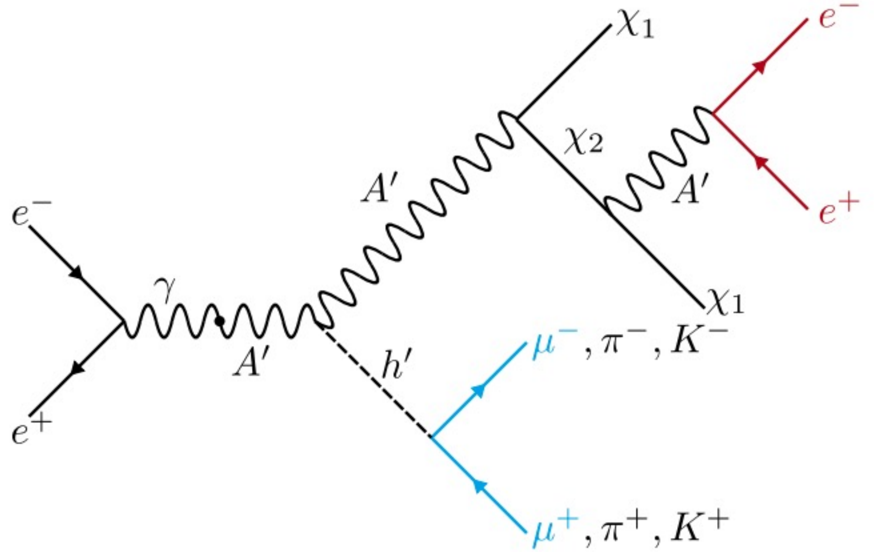
PRD 110, 112003 (2024)

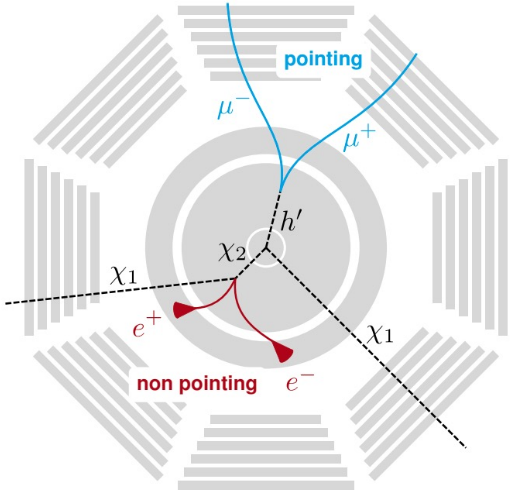
$\mathcal{B}^{UL}(\tau \to e(\mu)K_s^0) < 0.8(1.2)\times10^{-8}$	The most stringent constraints
$\mathcal{B}^{UL}(\tau \to \mu\mu\mu) < 1.9\times10^{-8}$	Less data, more restrictive than Belle
$\mathcal{B}^{UL}(\tau^- \to \Lambda\pi^-(\bar{\Lambda}\pi^-)) < 4.7(4.3)\times10^{-8}$	The most stringent constraints

A dark Higgs boson in association with inelastic dark matter

[Preliminary results]

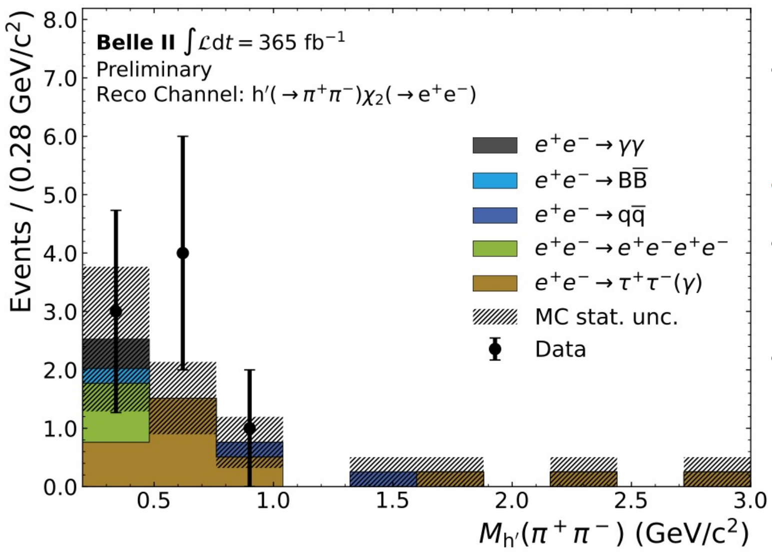
Dark photon A′, dark Higgs h′, and two dark matter states χ_1, χ_2



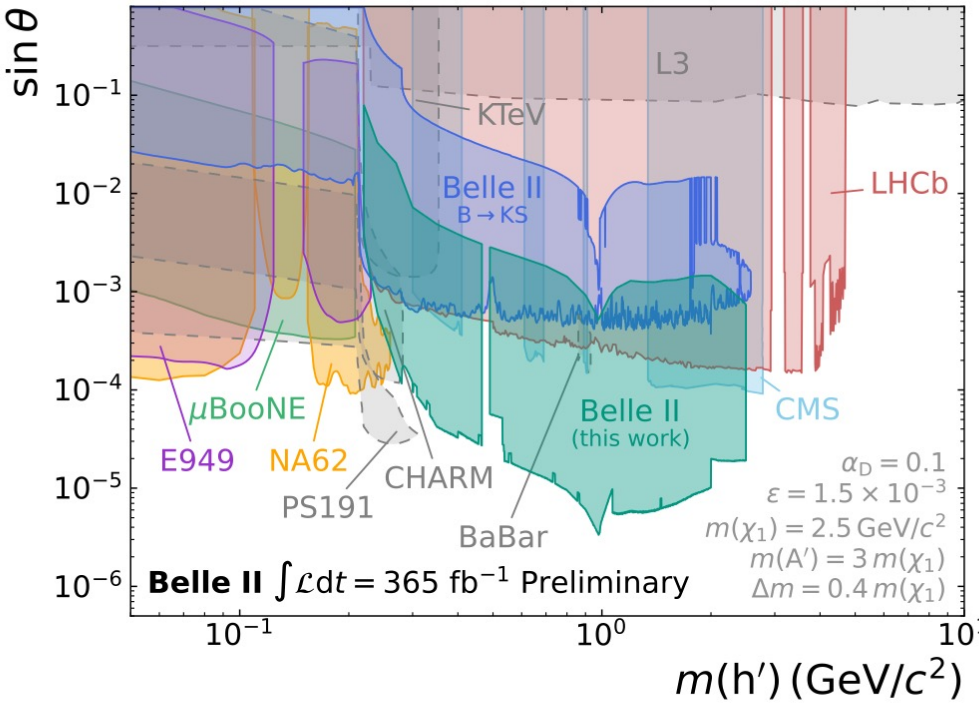


Looking for simultaneous production of A′ and h′

- 4 tracks in the final state
- 2 forming a pointing dispaced vertex
- mising energy



- cut-and-count strategy in $M_{h'}(x^+x^-)$ distributions
- No signicant excess found
- 8 events observed consistent with expected background
- Convert UL at 90% C.L. of $\sigma(e^+e^- \to \chi_1\chi_2 h')\times\mathcal{B}(\chi_2 \to \chi_1 e^+e^-)\times\mathcal{B}(h' \to x^+x^-)$ to mixing angle θ



Summary

- Belle II and Belle hold a unique data sample. A number of interesting measurements have been already performed in different fields, such as
  - First evidence for $\mathrm{B} \to \mathrm{K}\nu\bar{\nu}$, first search for $\mathrm{B}^0 \to \mathrm{K}_\mathrm{S}^0\tau^\pm\ell^\mp$, and most stringent UL for $\mathrm{B}^0 \to \mathrm{K}^{*0}\tau^+\tau^-$
  - World's best determination for A_{CP} in $\mathrm{D}^0 \to \mathrm{K}_\mathrm{S}^0\mathrm{K}_\mathrm{S}^0$, first or most precise measurements for some charmed baryon decays
  - Properties study of $\Upsilon(10753)$, unique in Belle II
  - τ factory! Precise property measurements and search for NP

- Only 1% of target luminosity collected so far. Stay tuned for more exciting results from Belle II.

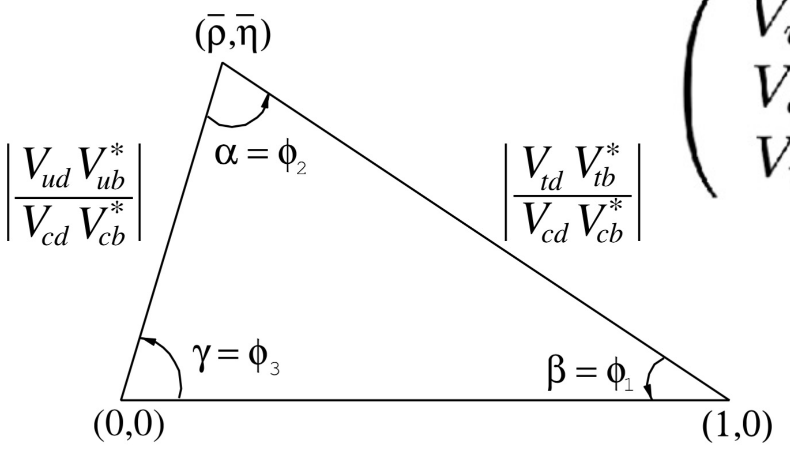
Thanks for your attention!

Backup slides

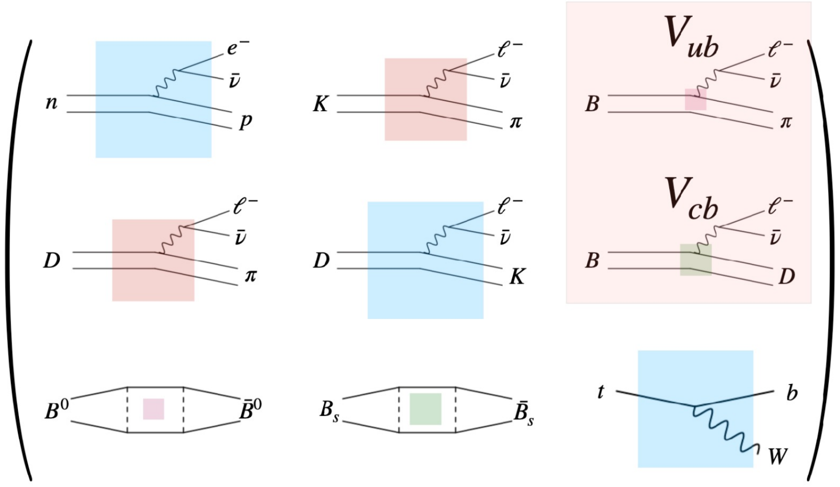
CKM matrix element

Belle II important task:

Constrain CKM unitarity triangle & test SM



$$\begin{pmatrix} V_{ud} & V_{us} & \boxed{V_{ub}} \\ V_{cd} & V_{cs} & \boxed{V_{cb}} \\ V_{td} & V_{ts} & V_{tb} \end{pmatrix}$$

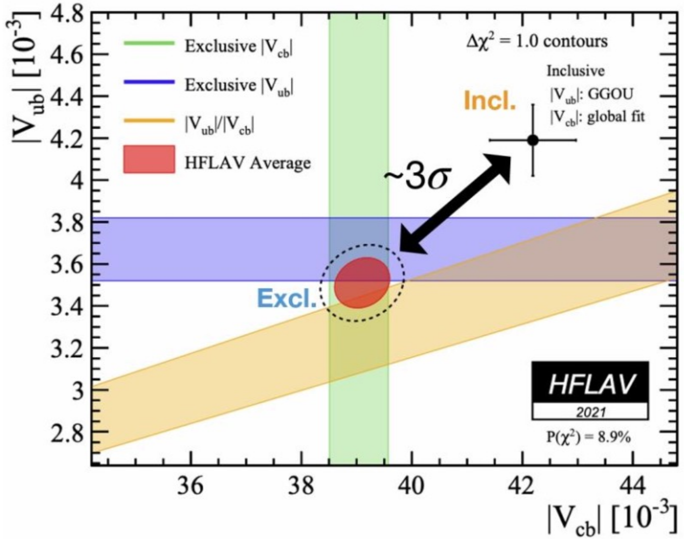


Exclusive: $B \to \pi l\nu, B \to \rho l\nu, B \to D^{(*)}l\nu, etc$

$\frac{dB}{dq^2} \propto |V_{xb}|^2 \times |FF(q^2)|^2$ Form factor from LCSR, LQCD

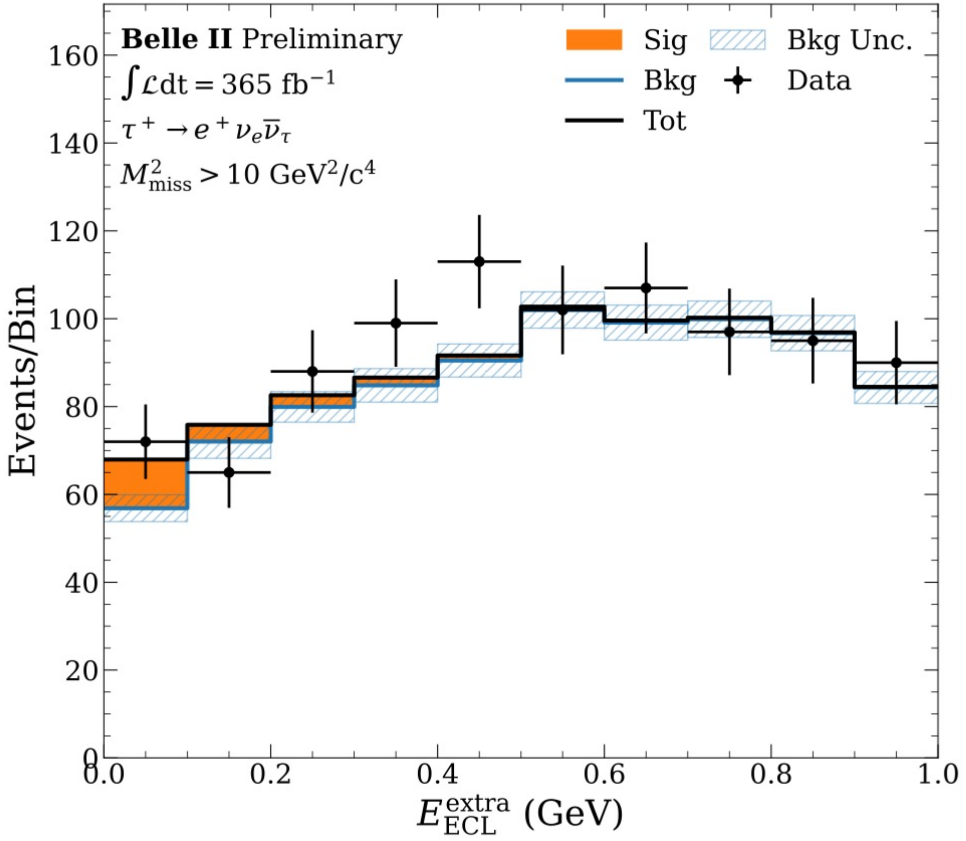
Inclusive: $B \to X_u l\nu, B \to X_c l\nu$

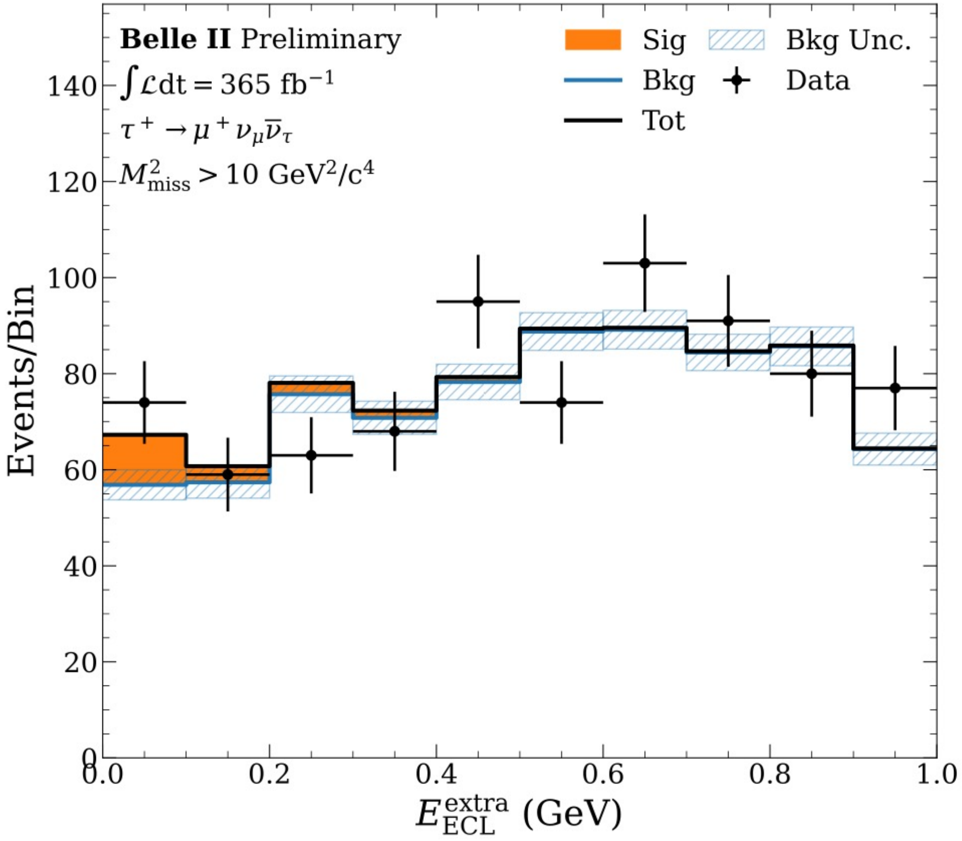
$\mathcal{B} \propto |V_{xb}|^2 \times \left[\Gamma(b \to q l \bar{\nu}_l) + \frac{1}{m_b} + \alpha_s + \cdots\right]$ From OPE



Several measurements carried out by Belle and Belle II:

$\lvert V_{cb}\rvert$	- Angular coefficients of $B \to D^* l\nu$	**Belle: PRL 133, 131801 (2024)**
$\lvert V_{ub}\rvert$	- $\lvert V_{ub}\rvert$ from $B \to (\pi,\rho)l\nu$ simultaneous analysis	New from Belle II
	- Simultaneous inclusive and exclusive $\lvert V_{ub}\rvert$	**Belle: PRL 131, 211801 (2023)**
$\frac{\lvert V_{ub}\rvert}{\lvert V_{cb}\rvert}$	- Ratio of inclusive $b \to c$ and $b \to u$ decays	**Belle: arXiv: 2311.00458**


Belle II Preliminary
$\int \mathcal{L} dt = 365\ fb^{-1}$
$\tau^+ \to e^+ \nu_e \bar{\nu}_\tau$
$M^2_{miss} > 10\ GeV^2/c^4$
Sig
Bkg Unc.
Bkg
Data
Tot
Events/Bin
E^{extra}_{ECL} (GeV)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Sig
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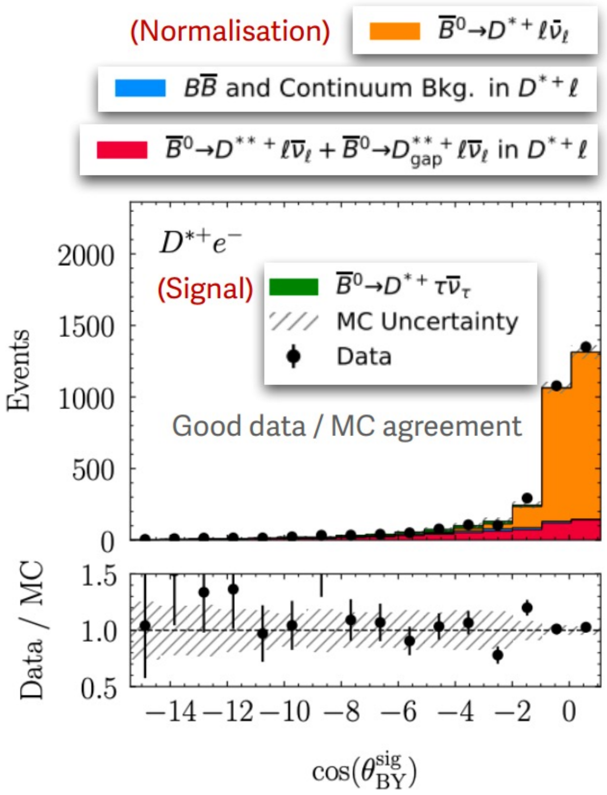
E^{extra}_{ECL} (GeV)

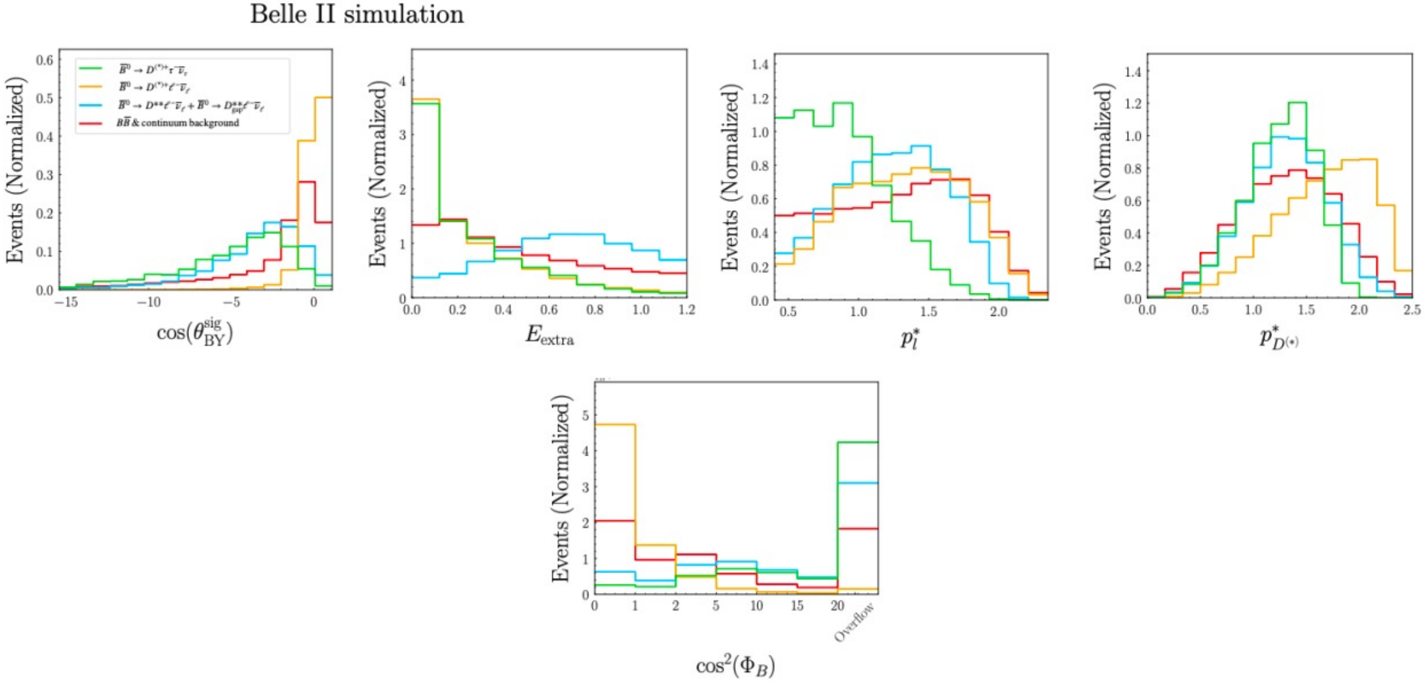
must exceed 1 GeV. The cosine of the angle between the B meson's momentum and its visible decay products in the c.m. frame is defined as

$$\cos\theta_{BY} = \frac{2E_{\mathrm{beam}}E_{\mathrm{Y}} - m_B^2 - m_{\mathrm{Y}}^2}{2\,|\vec{p}_B|\,|\vec{p}_{\mathrm{Y}}|}\,, \qquad (2)$$

where E_{beam} is the beam energy, m_B is the B meson mass, and $|\vec{p}_B|$ is its momentum, computed from m_B and E_{beam}. Here $Y = D^{(*)}\ell$ represents the system of visible

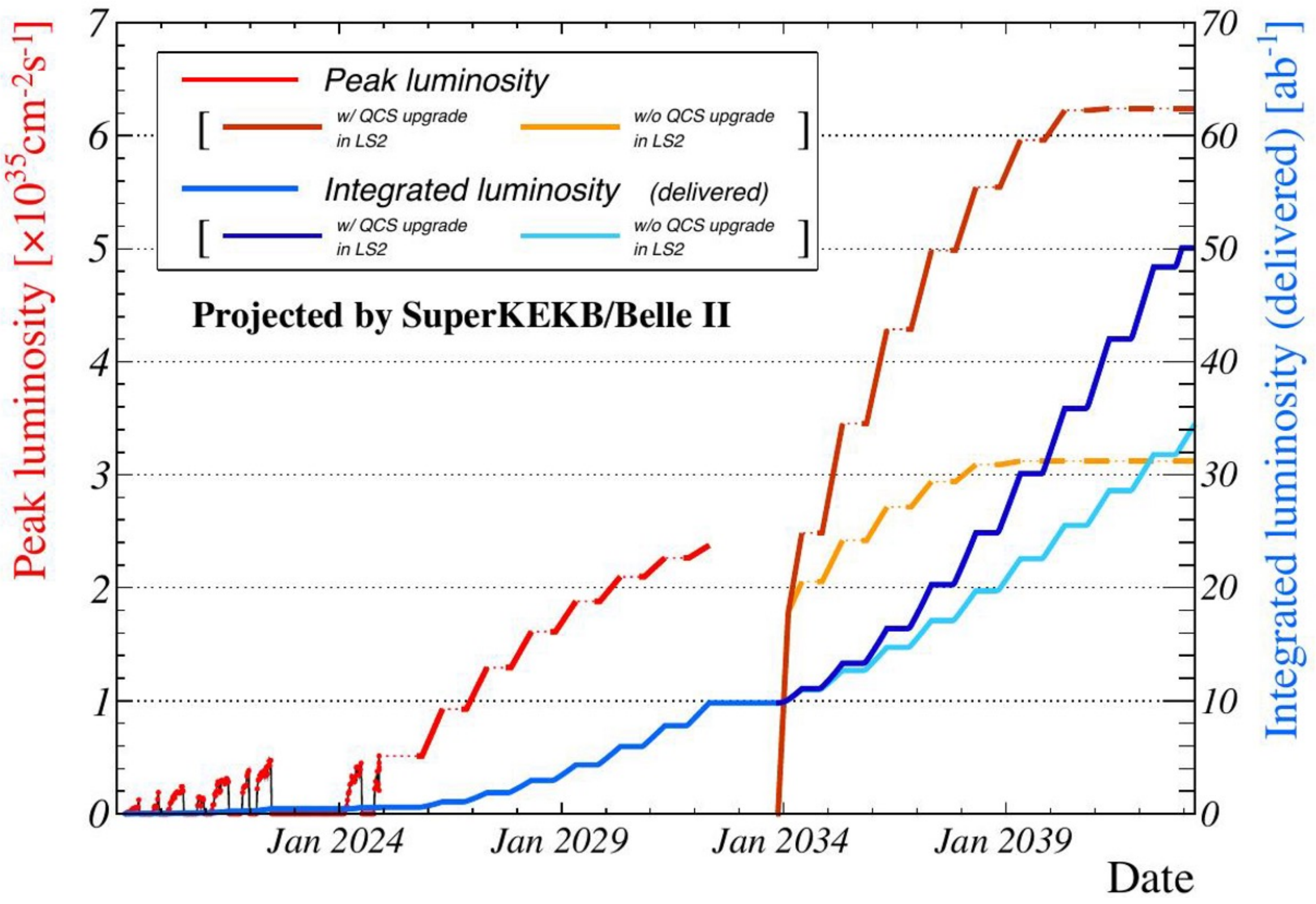


Input variables to BDT



$$\cos^2\Phi_B = \frac{\cos^2\theta_{BY}^{\mathrm{sig}} + \cos^2\theta_{BY}^{\mathrm{tag}} + 2\cos\theta_{BY}^{\mathrm{sig}}\cos\theta_{BY}^{\mathrm{tag}}\cos\gamma}{\sin^2\gamma}$$

Data-taking plan at Belle II



- Until 2026, about 1 ab^{-1} data, comparable to Belle
- Until 2029, about 4 ab^{-1} data.