

天主教輔仁大學創校百年校慶
FU JEN CATHOLIC UNIVERSITY 100TH ANNIVERSARY



CP violation in B decays at BelleII

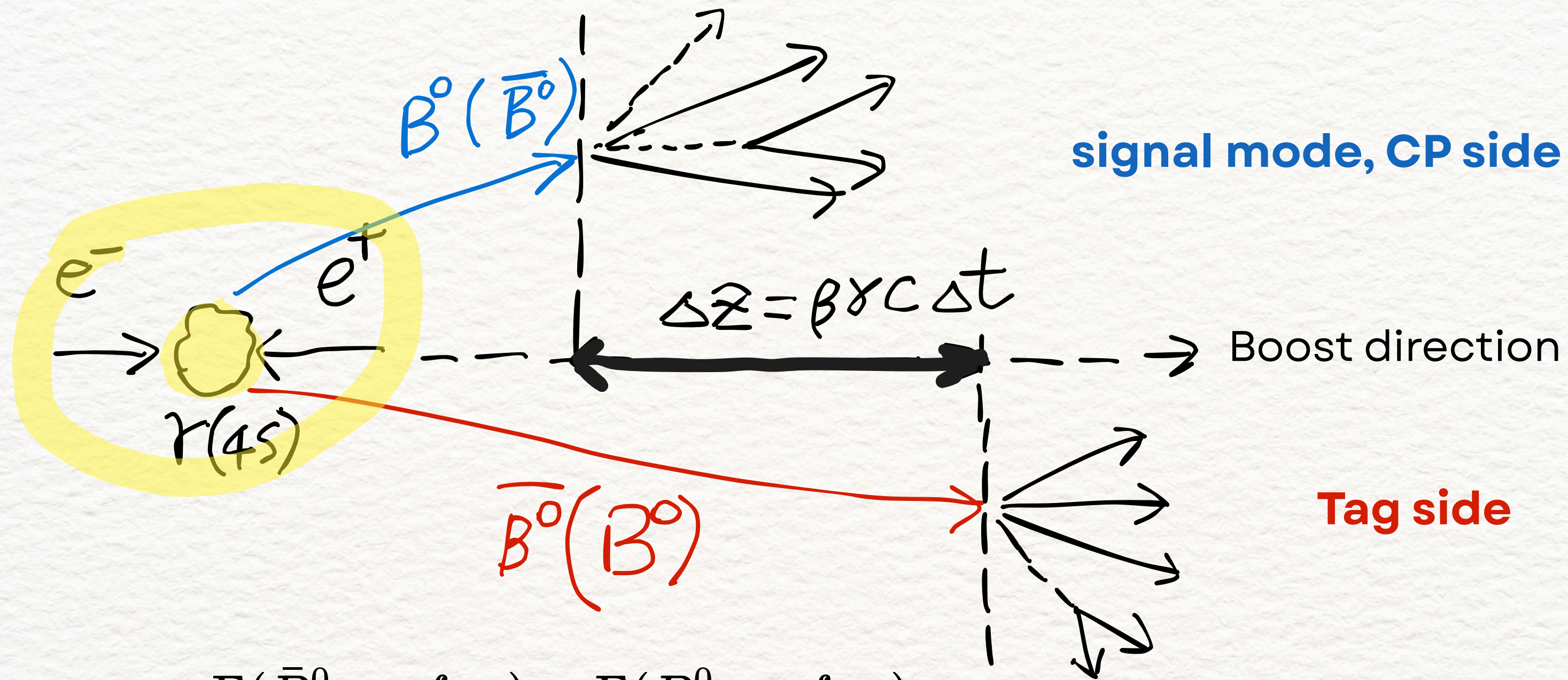
GFlaT

Ming-Chuan Chang (Jeri) on behalf of Belle/Belle II

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Vietnam Flavour Physics Conference 2025
18–22 Aug 2025

Strategy for CP measurements

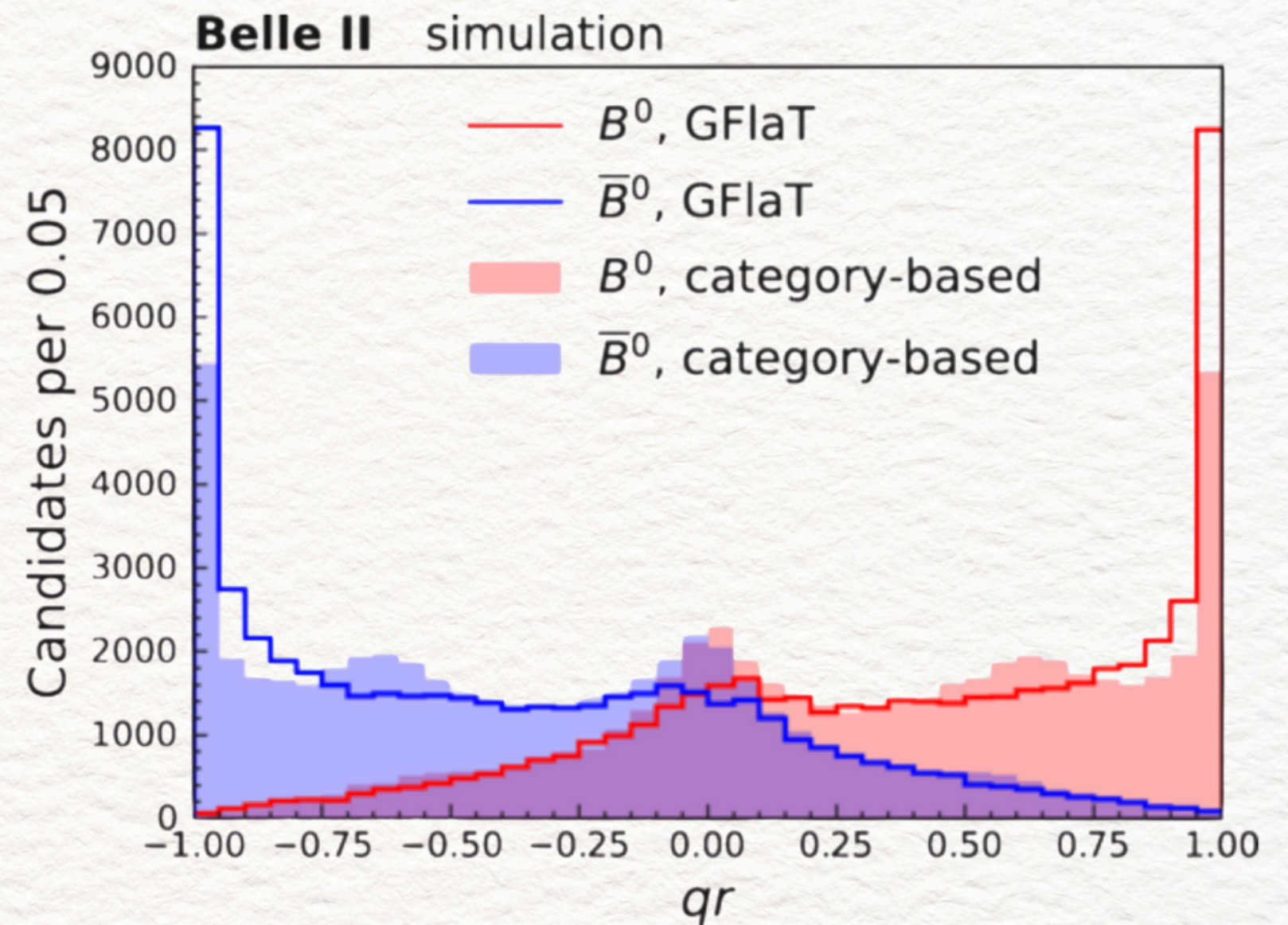


$$A_{CP} = \frac{\Gamma(\bar{B}^0 \rightarrow f_{CP}) - \Gamma(B^0 \rightarrow f_{CP})}{\Gamma(\bar{B}^0 \rightarrow f_{CP}) + \Gamma(B^0 \rightarrow f_{CP})}$$

$$\Delta z \sim 140 \mu m$$

Flavour Tagger

- New tool for Flavour Tagger
 - **GFlaT** (Graph Flavour Tagger) is a **graph neural network (GNN)**-based algorithm
 - enhance flavour tagging of neutral B mesons produced in $\Upsilon(4S)$ decays.
- **37%** effective tagging efficiency.
- $q = +1, B^0$ tag – side
 $q = -1, \bar{B}^0$ tag – side
- $r \in [0, 1]$ quality of flavor assignments

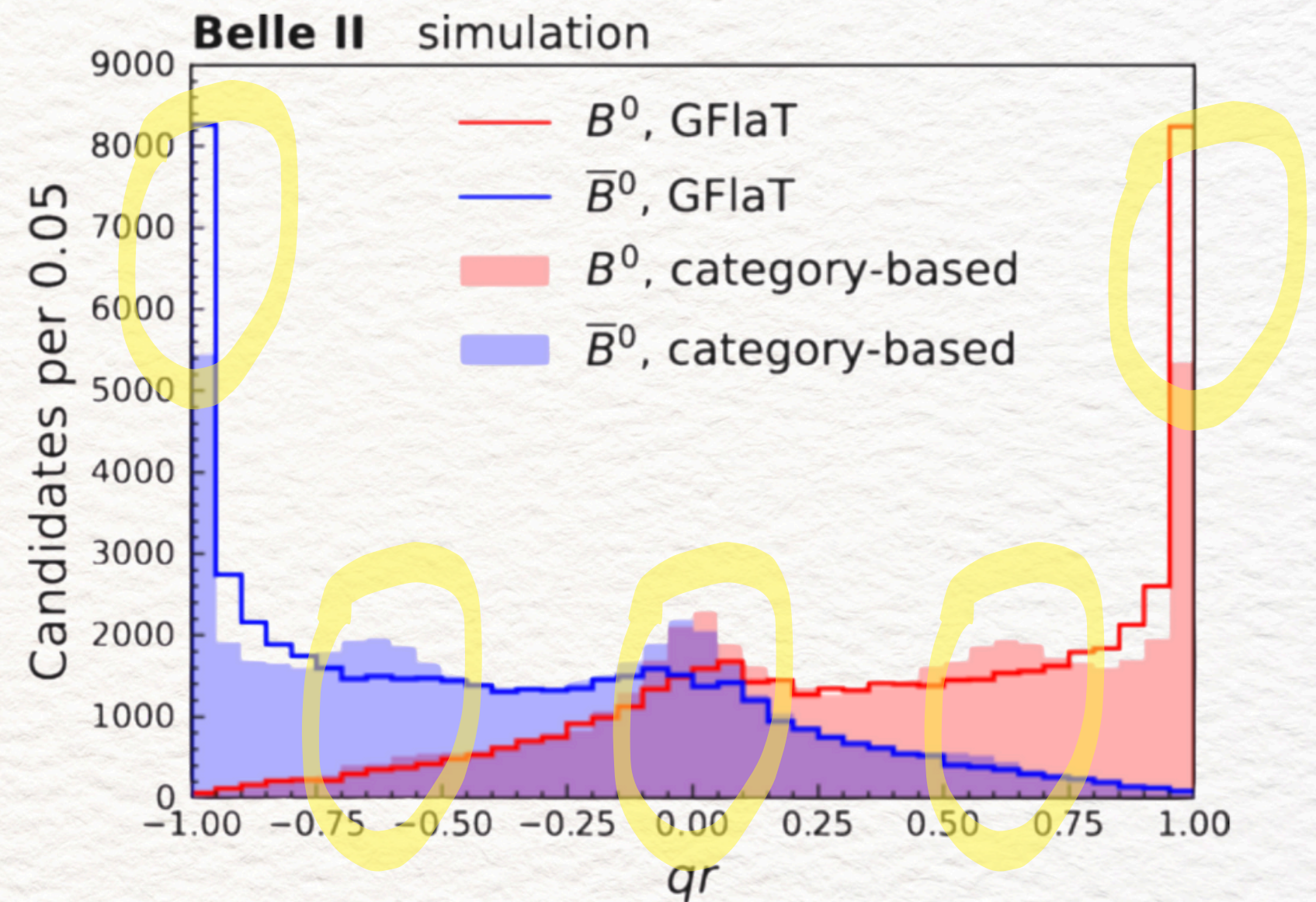


PRD 110, 012001 (2024)

Flavour Tagger

$$B^0 \rightarrow J/\psi K_S^0$$

GFlaT better distinguishes: the peaks at $|qr| \approx 1$ are higher and the bumps at $|qr| \approx 0$ and $|qr| \approx 0.65$ are smaller.

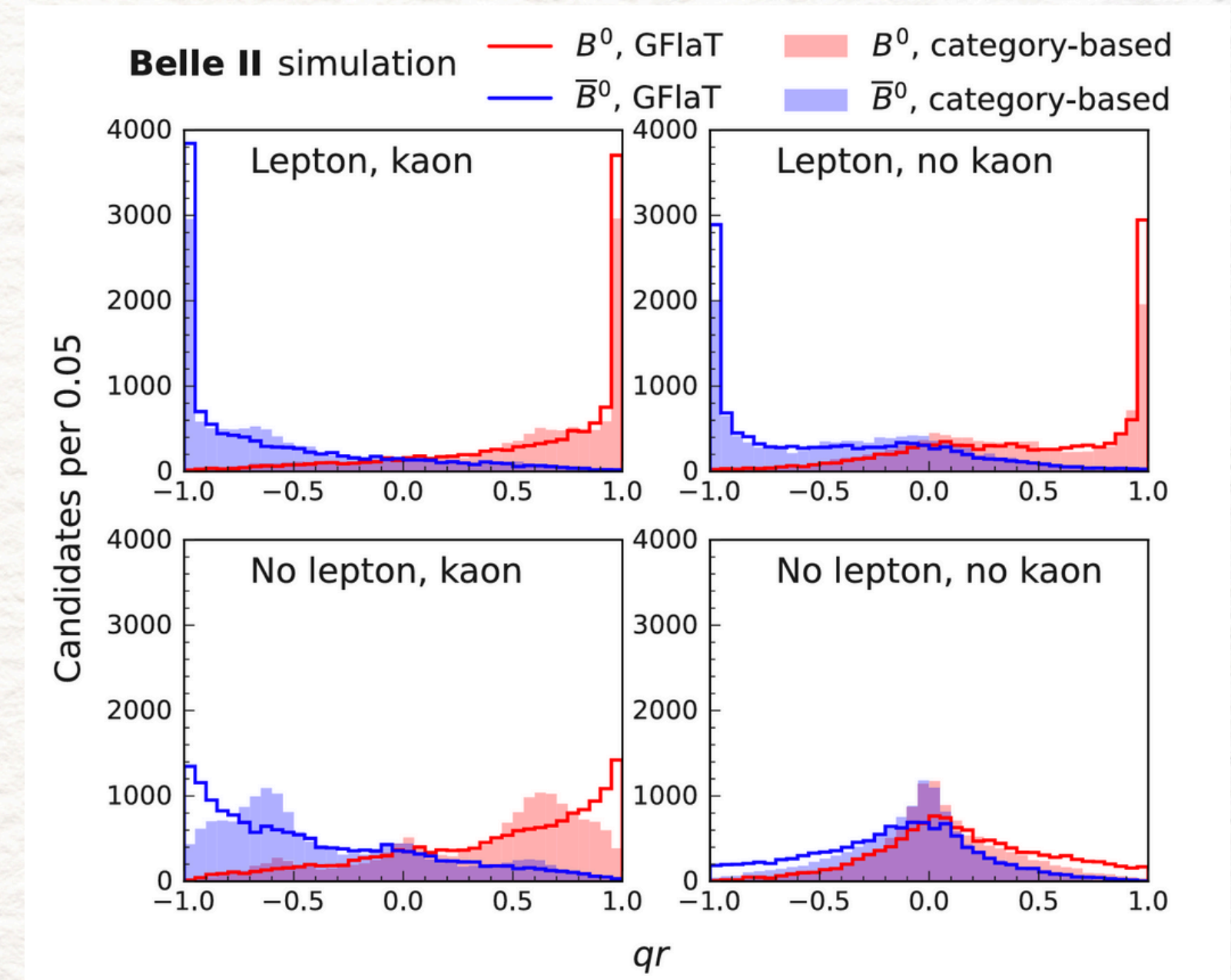


true B^0 and \bar{B}^0 for independent test data, 100k events.

Flavour Tagger

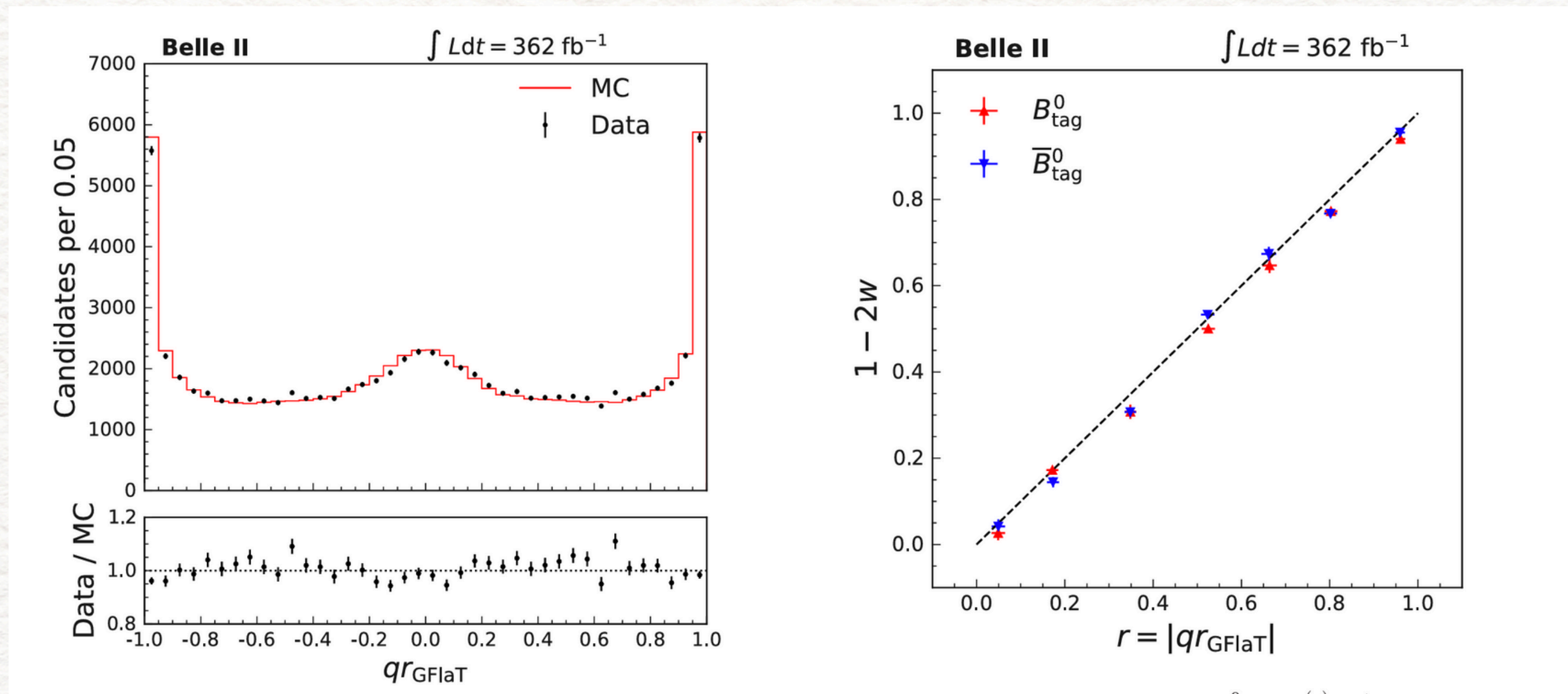
$$B^0 \rightarrow J/\psi K_S^0$$

- Events classified according to the presence of **charged leptons or kaons** in the Rest of Events (ROE).
- Performance is **optimal** when both a lepton and a kaon are present

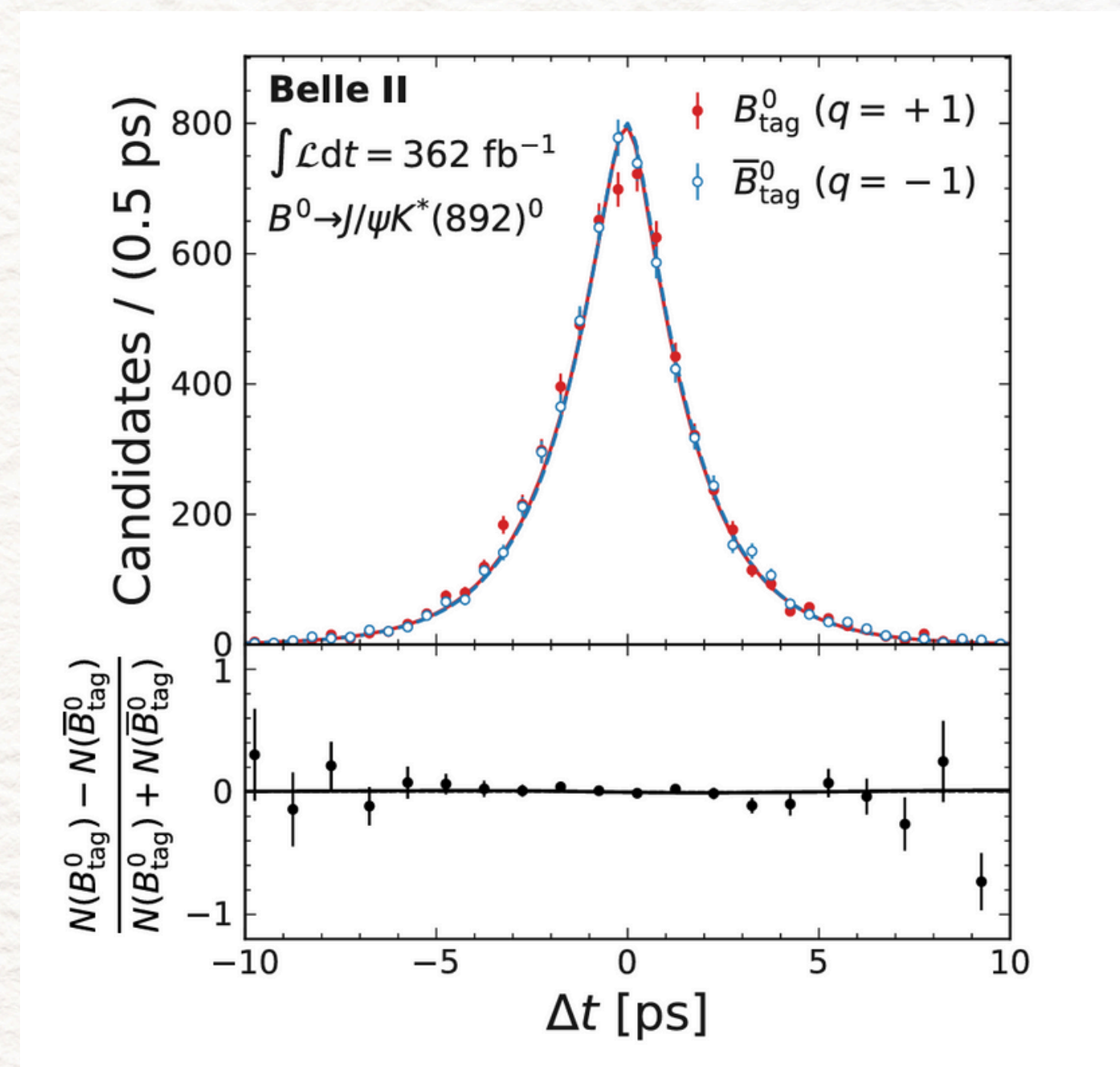
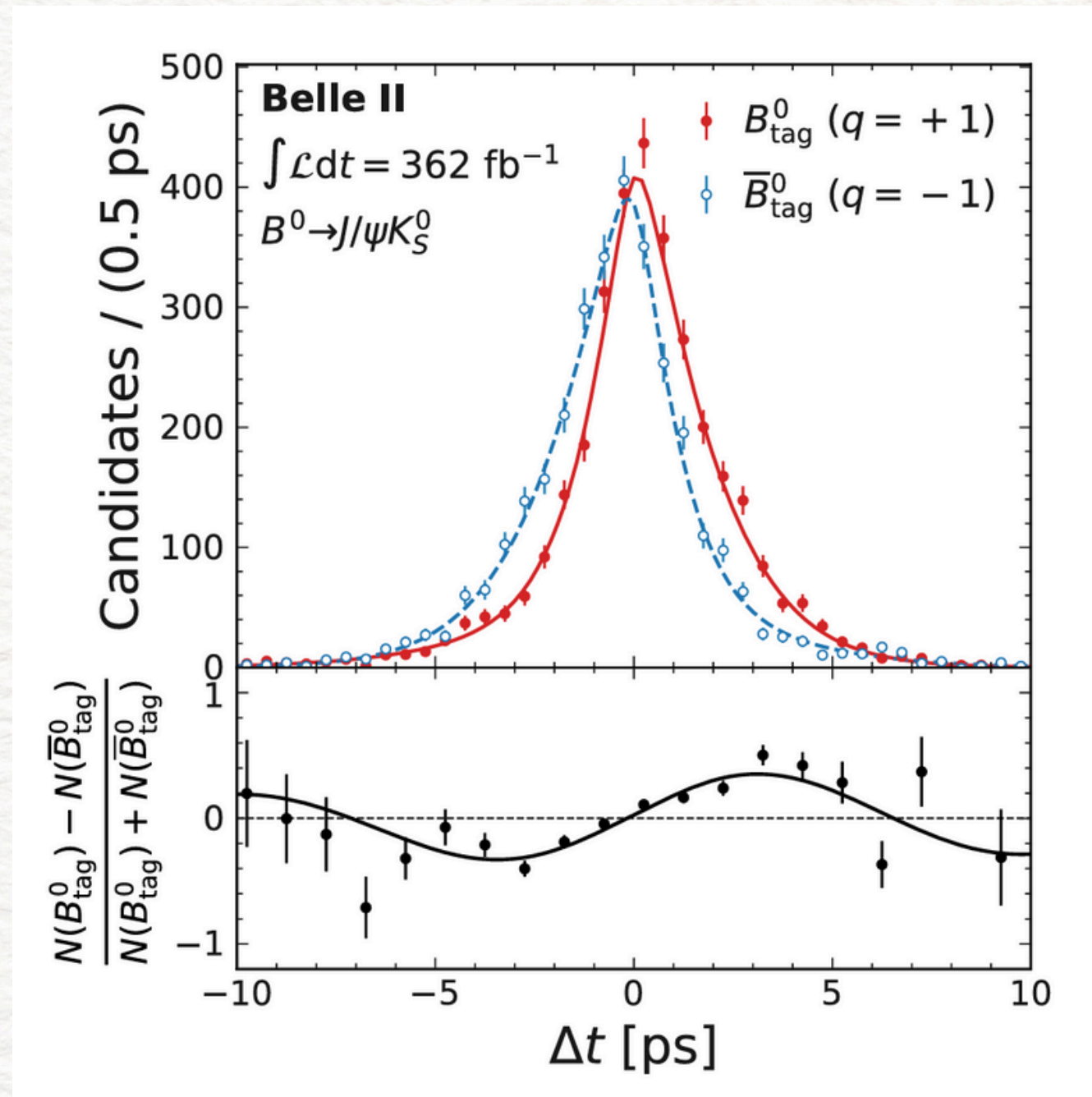


Flavour Tagger

evaluate GFlaT's performance using events in which B_{sig} decays to the $D^{(*)-}\pi^+$ final state



Flavour Tagger: quiz



References

- New graph-neural-network flavor tagger for Belle II
[PRD 110, 012001 \(2024\)](#)