Search for the rare decays $B \to K\nu\bar{\nu}$ at Belle II

Group Meeting - B2Knunu

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Université
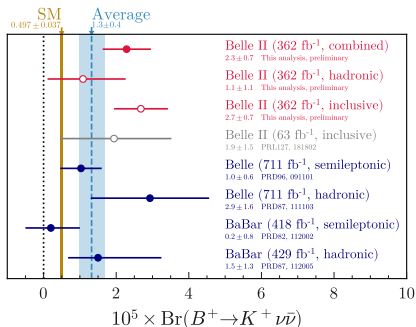de Strasbourg

Belle II

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State of the art:

- Analyses carried at Belle II for Hadronic Tagged Analysis (HTA), Inclusive Tagged Analysis (ITA) and combined

- Decay channel: $B^+ \rightarrow K^+ \nu \bar{\nu}$

- Results:

$$10^5 \times \mathrm{Br}(B^+ \rightarrow K^+ \nu \bar{\nu})$$

Main goal

- Carry the same analysis for the Semileptonic Tagged Analysis (STA)
- Compare the results between the three analyses for completion with respect to the previous anaylises (BaBar and Belle)
- Will do for the decay channel $B^+ \to K^+ \nu \bar{\nu}$
- May also do it for $B^* \to K^* \nu \bar{\nu}$ (need to be done anyway by someone)

First approach

- Very similar to HTA since exclusive analysis
- Will use *semileptonic* FEI instead of hadronic
- Variable of interest for HTA: q^2
- $\rightarrow$ Variable of interest for STA: q^2 and θ_{BY}

Quests

Main quests:

1. Take the previous workflow, understand it and automatize it using B2LUIGI (95% done)

2. Adapt the workflow to the STA (partly done by Jacopo)

3. Change the PID corrections to run dependent

Side quests:

1. Switch the plots from homemade functions (.png, burk) to PLOTHIST (.pdf, wow)

2. Change computation of uncertainties to more standardized way → may use SYSVAR if available

3. Use CABINETRY for management of PYHF fits

4. Check for usage of PYHFCORR for correlation in PYHF fits

Active quests:

1. Take the previous workflow, understand it and automatize it using B2LUIGI (95% done)

2. Adapt the workflow to the STA (partly done by Jacopo)

3. Change the PID corrections to run dependent

4. Test the new workflow with and without the Tree Fitter

5. Try $\Upsilon(4S)$ vertex fitting with TWINB

Git repositories

Gitlab repository: