# Search for the rare decays $B \to K\nu\bar{\nu}$ at Belle II
## Group Meeting - B2Knunu

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Université
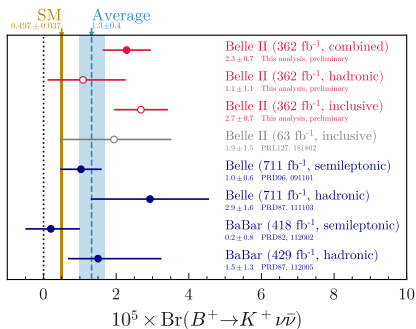de Strasbourg

Belle II

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## State of the art

**State of the art:**

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

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

- Results: evidence for $2.7\sigma$ above the SM expectation from combined analysis

# Main goal

- Carry the same analysis for the Semileptonic Tagged Analysis (STA)
- Compare the results on $B^+ \to K^+ \nu \bar{\nu}$ with STA for consistency check
- Will also do it for $B^* \to K^* \nu \bar{\nu}$

# First approach

- Very similar to HTA since exclusive analysis
- Will use *semileptonic* $\mathrm{FEI}$ instead of hadronic
- Important variables for HTA: $\Delta E$ and $M_{bc}$
- $\rightarrow$ Important variable for STA: $\cos(\theta_{BY})$

## 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 FEI corrections to semileptonic (for cross-check with respect to embedded)

4. Change the corrections to run dependent

**Side quests:**

1. Switch the plots from homemade functions to PLOTHIST

2. Change computation of uncertainties to more standardized way $\rightarrow$ will use SYSVAR or PYHFCORR

3. Check CABINETRY for management of PYHF fits

## Current tasks

**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:**