IDPASC School - Student Presentation
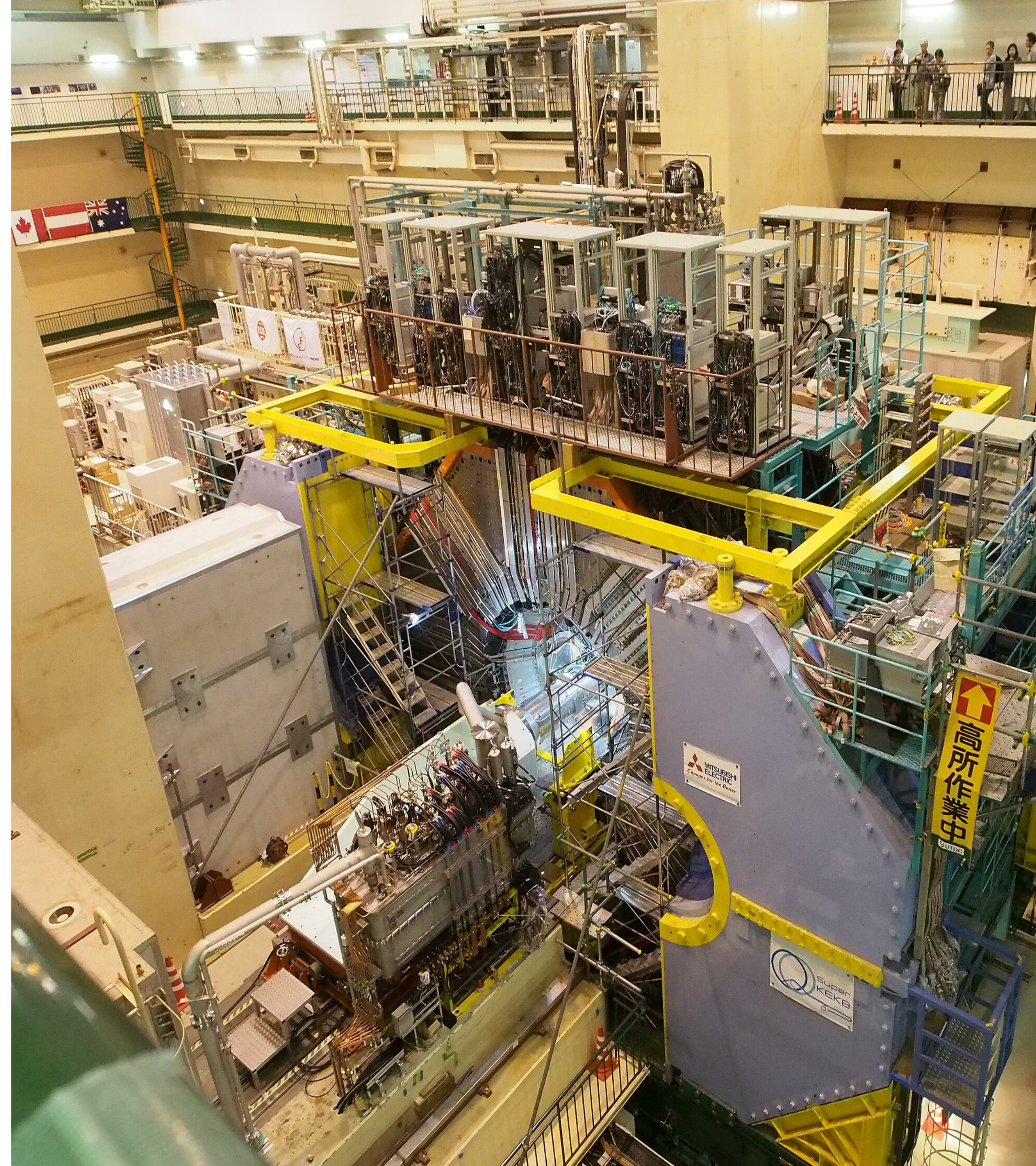
Thesis: Towards the Amplitude Analysis for $B^+ \rightarrow K^+\pi^+\pi^-\gamma$

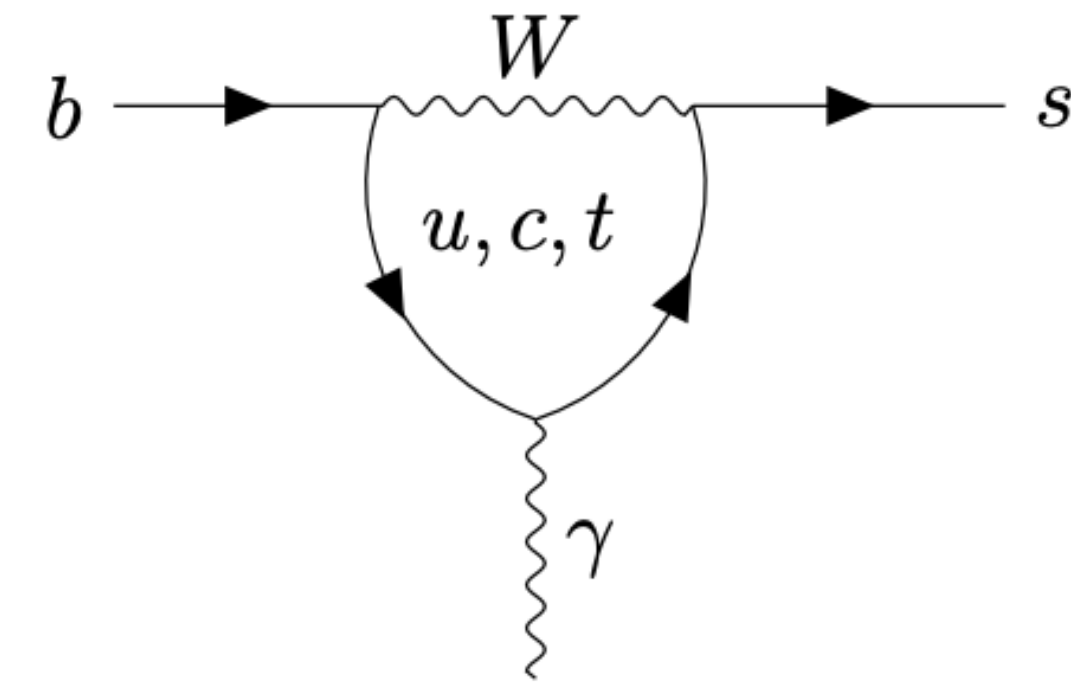# Introduction

- PhD Student at IPHC Strasbourg

- Started analysis in November 2024

- Thesis : Amplitude Analysis for $B^+ \rightarrow K^+\pi^+\pi^-\gamma$

  - *Supervisor : Dr. Isabelle Ripp Baudot*

- Working as a part of the Belle-II collaboration

- Engaged in other tasks across the collaboration

Motivation for Analysis

Penguin diagram in the SM for $b \rightarrow s\gamma$

- The amplitude analysis will supplement a measurement of TDCPV parameters (CWR1). [BELLE2-NOTE-PH-2024-038]

- $B^0 \rightarrow K*^{\pm}(K_S^0 \pi^{\pm})\pi^{\mp}\gamma$ and $B^0 \rightarrow K_S^0 \rho^0(\pi^{\pm}\pi^{\mp})\gamma$ need to be disentangled (the former is not a CP eigenstate).

- The $B^+ \rightarrow K^+ \pi^+ \pi^- \gamma$, has higher statistics. Related by Isospin symmetry →target mode for analysis.
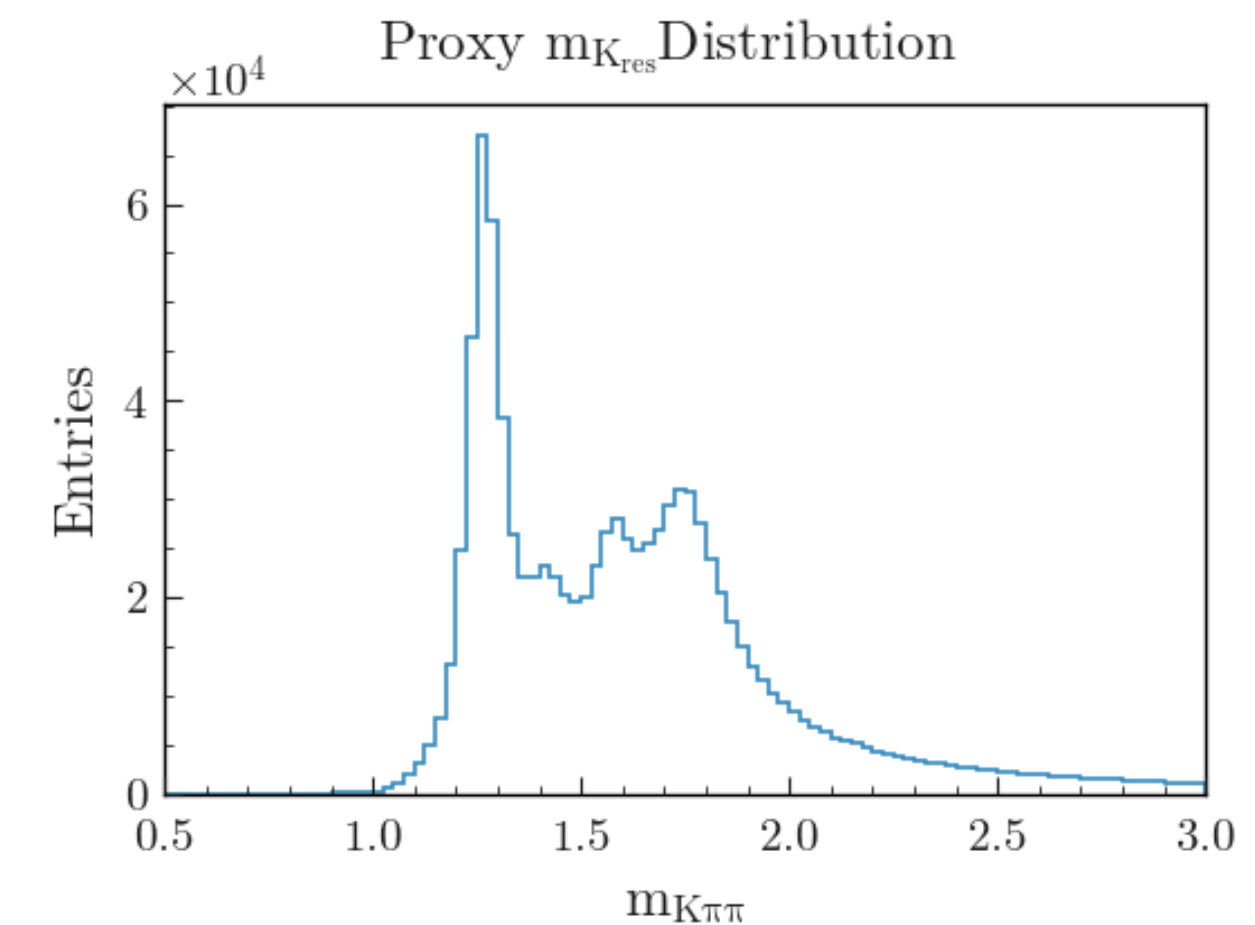

Expected Distribution of $m_{K\pi\pi}$ variable in our signal

Analysis

- **Event generation:** model intermediate resonances and physically accurate angular variables - 🟢

- Developing a feasible **fit strategy** for different channels (several not studied before) - 🟡

- Selections, Background suppression, Reconstruction - 🟡

  - *Courtesy : Mattéo Maushart*

- Fit Belle-II Run 1 and Run 2 data and obtain **amplitude** and **phase** of each channel - 🔵
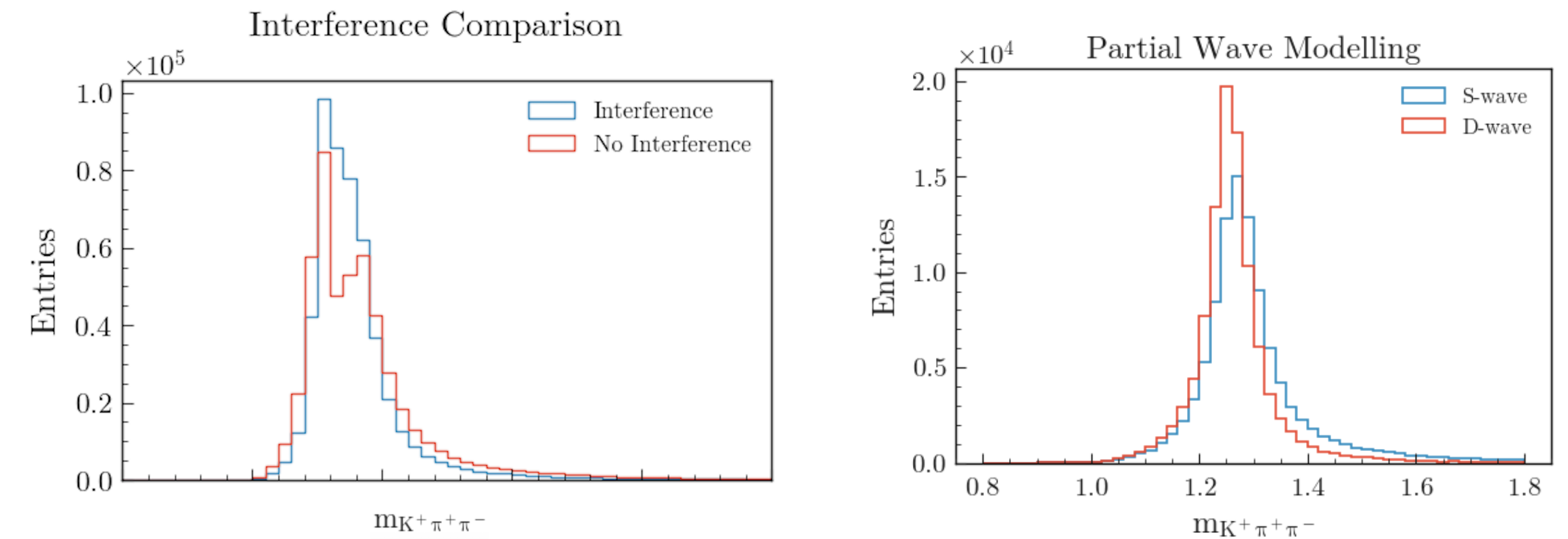
Physics modelling in our generation framework
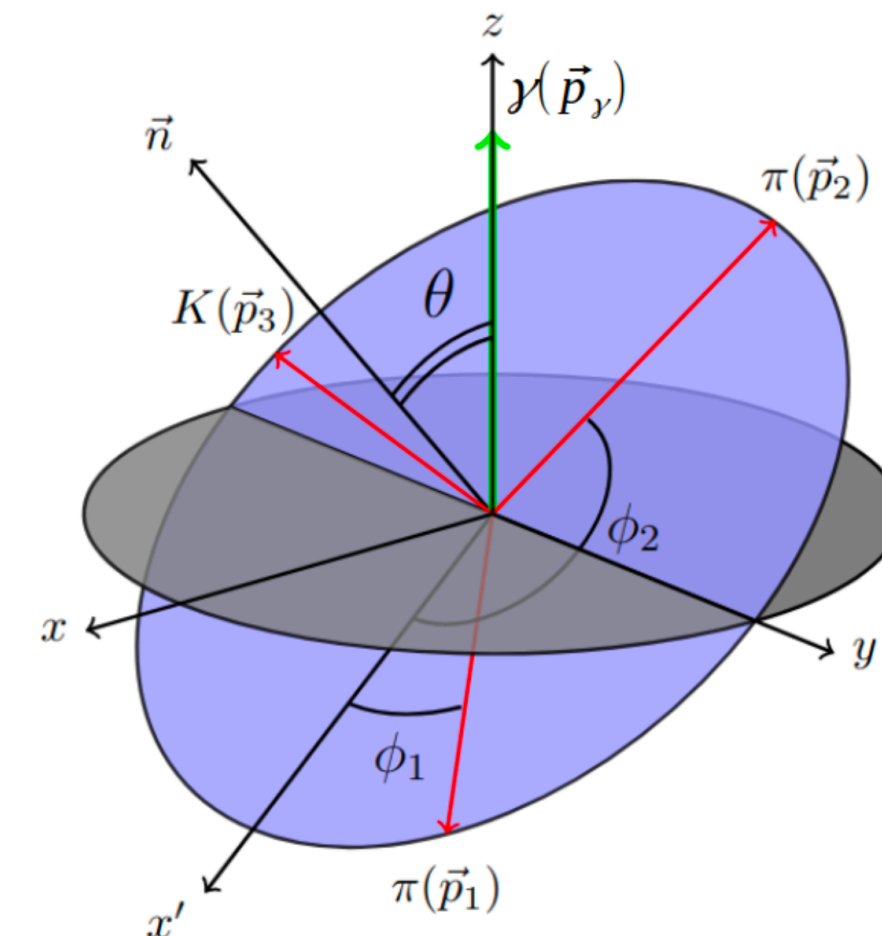
Relevant angular variables in the $K\pi\pi$ rest-frame

Source: Thesis by *Boris Knych*

Next Steps

- Develop our fitting strategy

- Sensitivity studies

- Progress towards analysis on real data

- Role of Data Processing manager at the Belle-II collaboration

Steps after Next Step

- Learn more physics

- Ask more questions

- Answer more questions (hopefully)