First results from Belle II commissioning run

Jakub Kandra on behalf of Belle II collaboration
I) Vertexing:
   - Time measurement
   - Detector:
     • Pixel detector
     • Strip detector

II) Tracking:
   - Mass measurement
   - Detector:
     • Pixel detector
     • Strip detector
     • Central drift chamber

III) Particle identification:
   - Flavour tagging
   - Detector:
     • Energy loss @ CDC
     • Cherenkov radiation @ ARICH, TOP
     • KLong-muon system

IV) Neutrals reconstruction:
   - Semileptonic decays
   - Rare decays
   - Dark matter
   - Detector:
     • Electromagnetic calorimeter
     • KLong-muon system
**Vertex detector performance**

**Commissioning run in 2018:**
Track from collisions is passing vertex detector

**Global cosmic run in 2019:**
Cosmic track is passing full vertex detector
Vertex detector performance

Precision and stability of pixel detector
Vertex detector performance

Precision and stability of strip detector

Belle II PRELIMINARY 2018

Entries 2330
Mean -0.6296
Std Dev 59.15

Ldt = 1.4 pb⁻¹

Counts
Residual in U direction [μm]

10/06/2018  17/06/2018  24/06/2018  01/07/2018  09/07/2019

Mean of residual in U [μm]

Belle II PRELIMINARY 2018

Entries 2330
Mean 6.33
Std Dev 89.05

Ldt = 1.4 pb⁻¹

Counts
Residual in V direction [μm]
- The SuperKEKB on the road to Nano-Beam Scheme: Narrow interaction point comes from strong focusing and large crossing angle.
- Main tracking detector is the Central Drift Chamber
- It connects VXD with TOP counters, ECL clusters and KLM sectors.
- Tracks from the CDC were available since first collisions.
- Detector was aligned within few weeks mainly using cosmic tracks.
- Magnetic field is measured to high accuracy.
Tracking performance

\[ K_s \rightarrow \pi^+ \pi^- \quad \Lambda \rightarrow p\pi^- \]

- Mass resolution is in good agreement with Monte Carlo predictions, on par with Belle.
Tracking performance

\[ J/\psi \rightarrow e^+e^- \]

\[ J/\psi \rightarrow \mu^+\mu^- \]

- Mass resolution is in good agreement with Monte Carlo predictions, on par with Belle.
Particle identification performance

- Energy loss in Central Drift Chamber using hadronic event sample.
Particle identification performance

- Visualisation of the Cherenkov rings in the time-of-propagation counter
Particle identification performance

$\phi \rightarrow K^+ K^-$

- An example of Kaon identification capabilities using combined information
Neutrals reconstruction performance

\[ e^+ e^- \rightarrow \mu^+ \mu^- \gamma \quad \pi^0 \rightarrow \gamma \gamma \]

- Good reconstruction of a single photon and a pair of photons.
Lepton physics: $\tau$ lepton

- Results are in good agreement with Monte Carlo predictions, on par with other experiments.
Summary

THE NEW GENERATION of FABRIQUE B FACTORY is READY to The NEW PHYSICS

“thank you for your attention :)

- Daniel Cuesta: "SuperKEKB and Belle II status and plans"
- Eldar Ganiev: "B physics re-discoveries with Belle II"
Belle II commissioning run means **Phase 2** in Belle II jargon. There was used full Belle II external detector with internal background detector (VXD samples shown in slide 4). Collisions were provided with full superconducting final focusing.