National Institute of Nuclear and Particle Physics

Mixing and CP violation in the quark sector

BELLE-II

Studying rare decays of B mesons and tau leptons

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- **Scientific leader:** Karim Trabelsi (IJCLab) *
- **Laboratories involved:** CC-IN2P3 (Lyon), CPPM (Marseille), IJCLab (Orsay), IPHC (Strasbourg)
- **Nature:** research infrastructure
- **Status:** international project in operation, on the site of the KEK research organisation (Tsukuba, Japan)
- **Website:** https://www.belle2.org/

SCIENTIFIC OBJECTIVES

The major challenge of the BELLE-II experiment is to find signs of new physics, not described by the standard model of particle physics. For example, it looks for the existence of hypothetical dark matter particles or lepto-quarks that would explain the recent anomalies observed in the decay of B mesons. The BELLE-II precision detector is dedicated to the very fine characterisation of B mesons, charmed hadrons or tau leptons, to highlight deviations in the observables of rare decays or to discover forbidden decays in the Standard Model, which would be a sign of new physics.

RESOURCES DEPLOYED

- The SuperKEKB collider, a super B-meson factory, is the world's brightest particle accelerator.
- A central drift chamber (CDC) with smaller cells, a vertex detector consisting of four layers of silicon strips and two layers of pixels (DEPFET).
- Identification of charged and neutral particles (a combination of five sub-detectors).
- Processing of more than 100 Petabytes of data shared between Canada, France, Germany, Italy, Japan and the USA.

118 institutes

800 scientists

10 years of operation

26 participating countries

100 Petabytes of data to be processed

IN2P3 CONTRIBUTIONS

- Upgrade of the data acquisition system using the PCIe40 card, which allows reading via high speed optical links and the data to be described on the server at a rate of 100 Gb/s.
- The IN2P3 CC is a major contributor to data processing (15% of the world effort). From 2021 onwards, it will host and manage this unique fraction of the world's data and make it available to the scientific community.
- Participation in the vertex detector (SVD) and the charged particle identification detector (ARICH).
- Design and construction of the luminometer, a device for rapid luminosity control using single-crystal artificial diamond sensors.

2019 Launch of the physics programme for BELLE-II

2021 BELLE-II collects its first reverse attobarm of data

2021 - 2022 Replacement of the data acquisition system and the vertex detector (pixels)

2024 Addition of radio frequency cavities planned

2029 Expected end of the BELLE-II programme

* Since 2020

April 2022