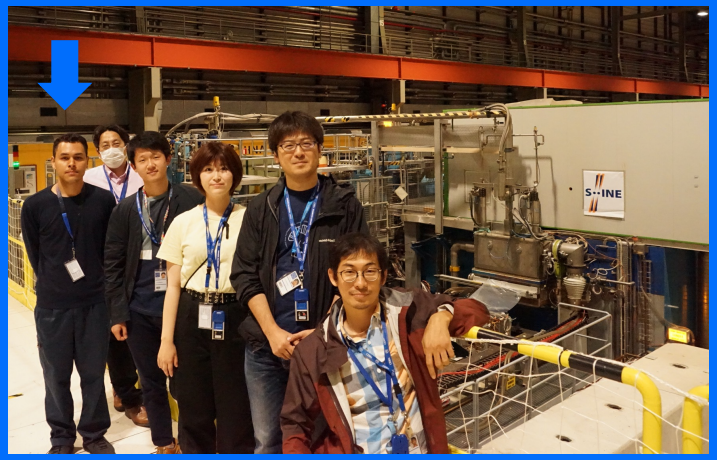
Personal research experience



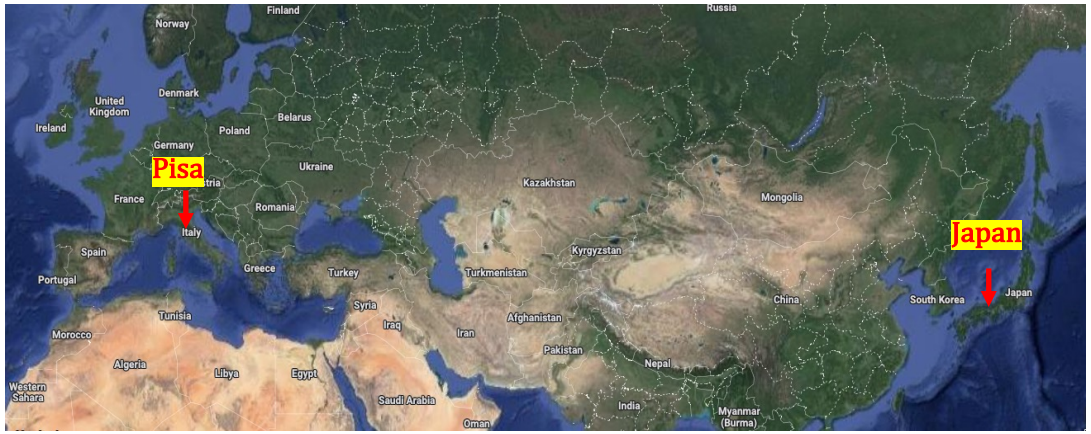
Interim Review Meeting INTENSE
December 2nd 2022

Hussain Kitagawa
University of Pisa
Supervisor: Prof. Simone Donati
Email: kitagawa0913@s.okayama-u.ac.jp

Introduction

About

Hussain Kitagawa
Hyogo, Japan



Okayama University (2018~ 2022)

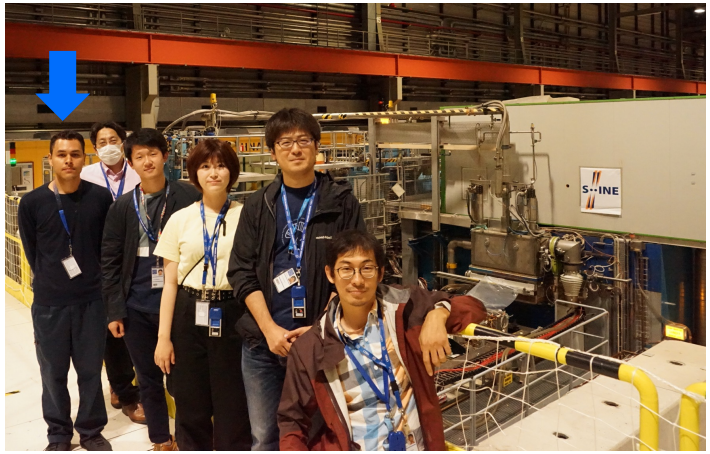
- B.S. and M.S. in Physics
  - CERN Summer Student Programme (online)
  - Master thesis
    “Measurement of the Charge Ratio of Cosmic-Ray Muons in Super- Kamiokande”

- Research Student
  - p+T2K Replica Target at NA61/SHINE CERN

University of Pisa (Dec 2022 ~)

- Early Stage Researcher

NA61/SHINE CERN(July 2022)



Master degree in Physics

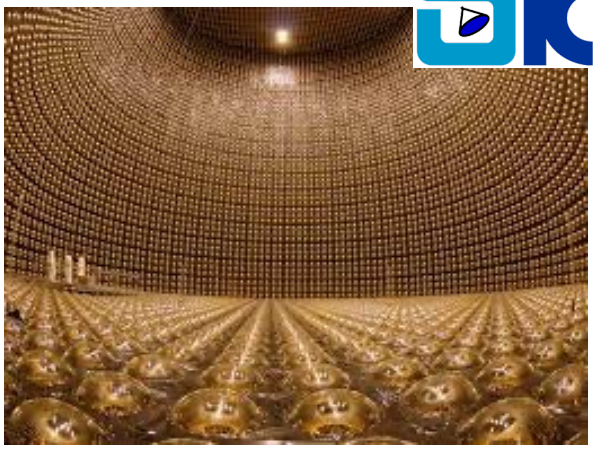
Thesis: Measurement of the Charge Ratio of Cosmic-Ray Muons in Super-Kamiokande

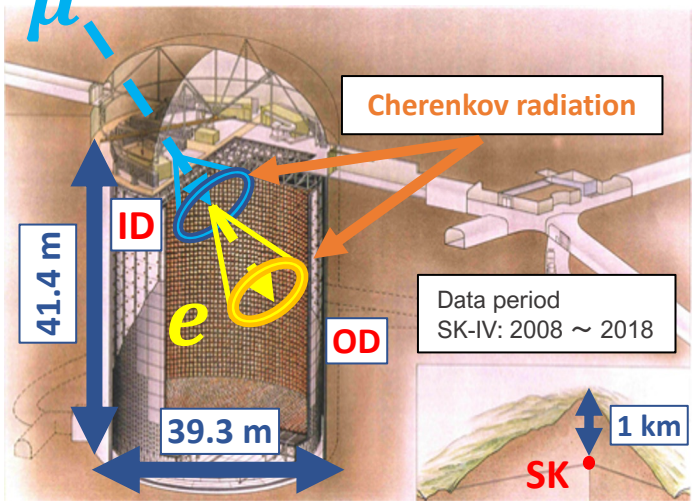
- Muon charge ratio $R(\mu^+/\mu^-)$

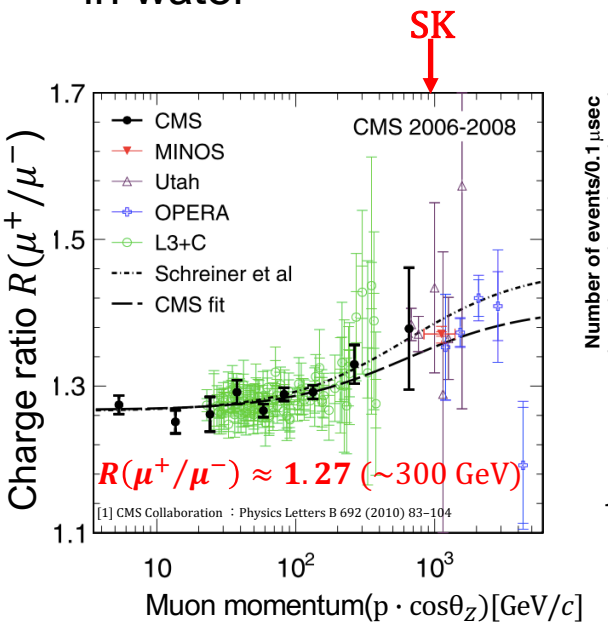
→ precise estimation of hadron productions and the atmospheric neutrino flux

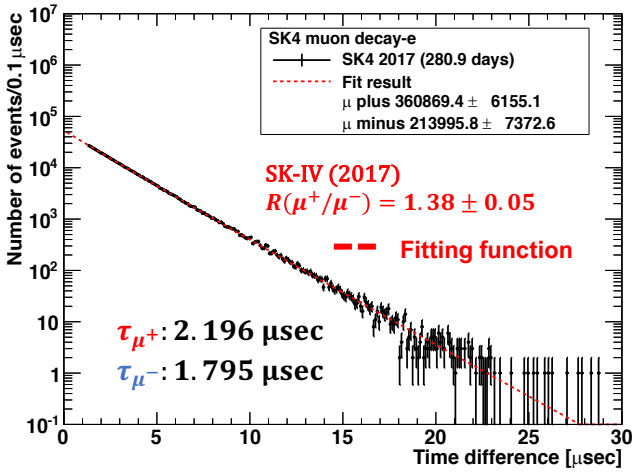
→ search for $\mu - e$ decay candidates

→ counting total $N_{\pm}$ considering lifetime $\tau_{\mu^{\pm}}$ difference in water







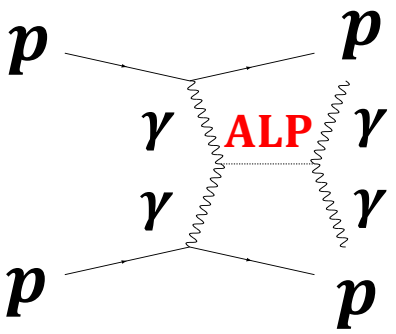


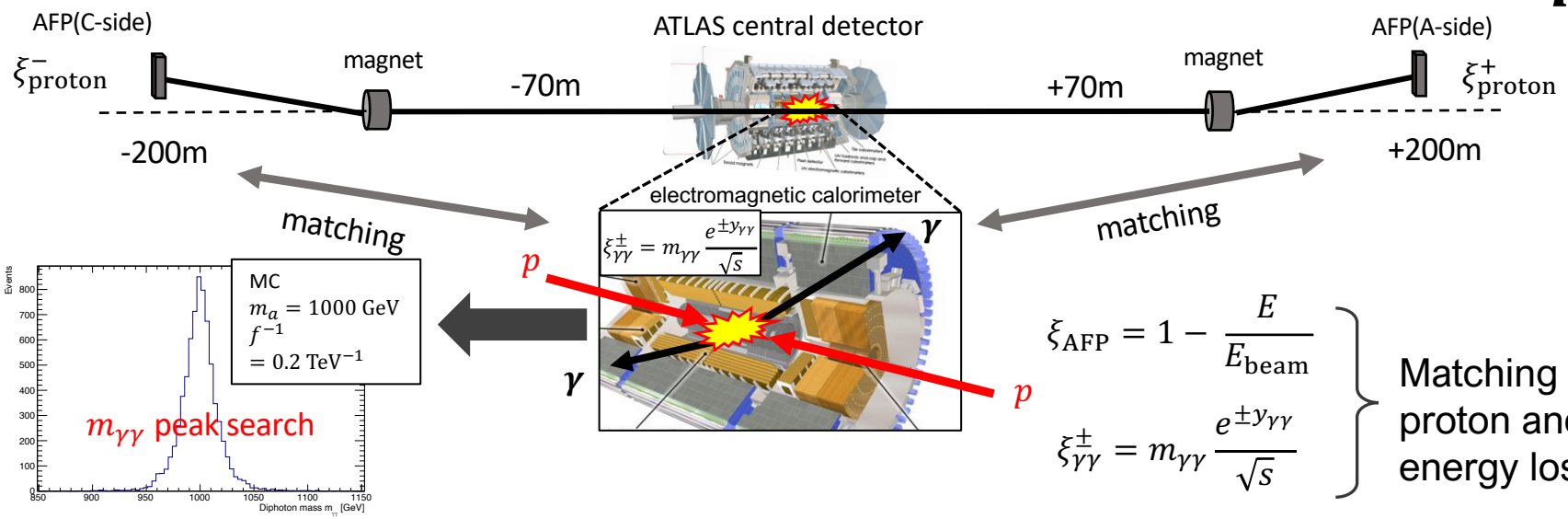
Master degree in Physics

Project: Searching for ALPs in Light-by-light Scattering in pp Collisions Using AFP Proton(AFP) Tagging with the ATLAS Detector

Axion-like particles (ALPs)

- Appear in extensions of the Standard Model and assumed to compose dark matter
- Photon scattering in the Coulomb field of proton
- Photons fuse to create ALP and decay into $\gamma\gamma$ pair
  → mass m_{ALP}, coupling constant f^{-1}





$$\xi_{\mathrm{AFP}} = 1 - \frac{E}{E_{\mathrm{beam}}}$$

$$\xi^{\pm}_{\gamma\gamma} = m_{\gamma\gamma}\frac{e^{\pm y_{\gamma\gamma}}}{\sqrt{s}}$$

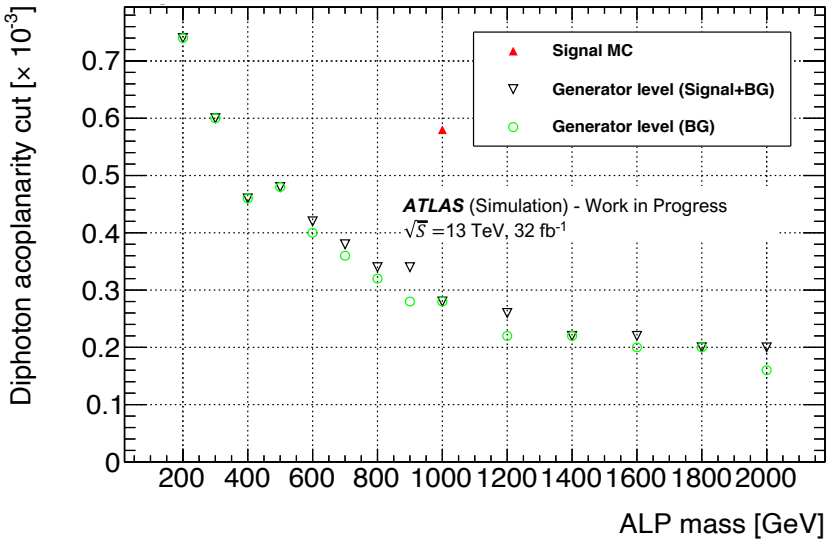
Matching between proton and photon energy loss

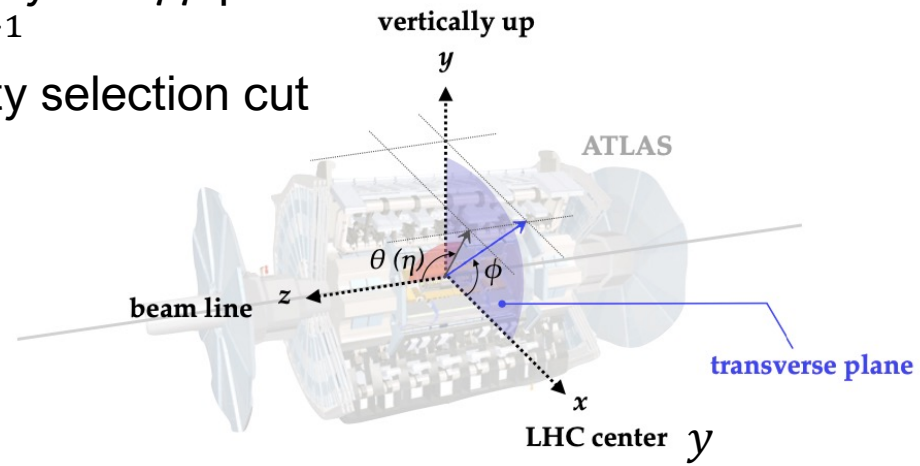
Master degree in Physics

Project: Searching for ALPs in Light-by-light Scattering in pp Collisions Using AFP Proton(AFP) Tagging with the ATLAS Detector

Axion-like particles (ALPs)

- Appear in extensions of the Standard Model and assumed to compose dark matter
- Photon scattering in the Coulomb field of proton
- Photons fuse to create ALP and decay into $\gamma\gamma$ pair
  $\rightarrow$ mass m_{ALP}, coupling constant f^{-1}
- Optimization of diphoton acoplanarity selection cut for an ALP search in pp collision





$$acoplanarity = 1 - |\Delta\phi_{\gamma\gamma}|/\pi$$

$$\approx 0 \rightarrow back\ to\ back$$