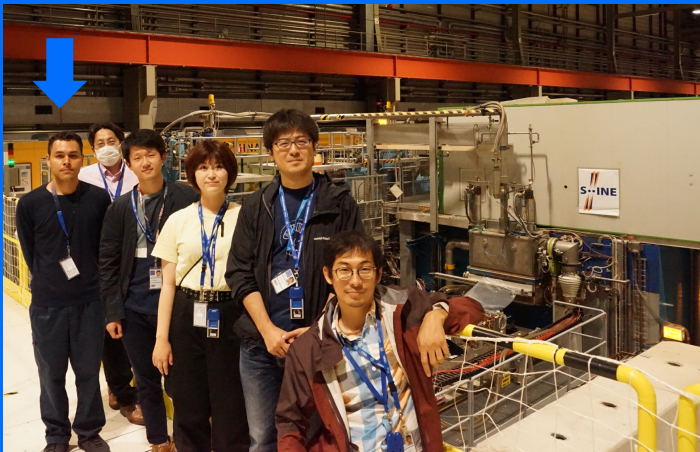


# Personal research experience



Interim Review Meeting INTENSE  
Nov 23<sup>rd</sup> 2022

Hussain Kitagawa  
University of Pisa

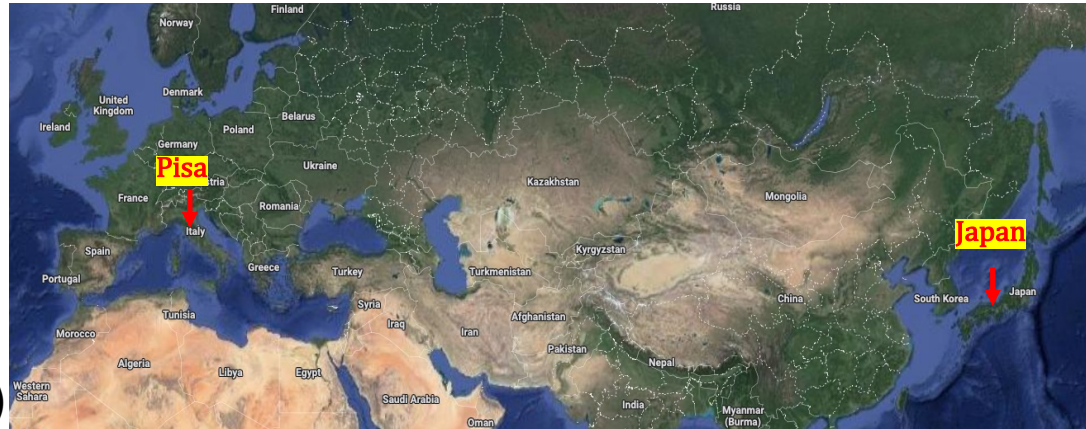
Supervisor: Prof. Simone Donati

*Email: [kitagawa0913@s.okayama-u.ac.jp](mailto:kitagawa0913@s.okayama-u.ac.jp)*

## 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”

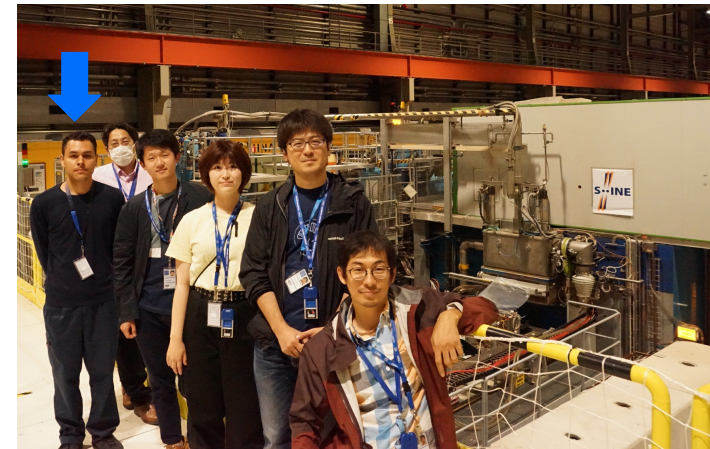
- Research Student

- p+T2K Replica Target at NA61/SHINE CERN

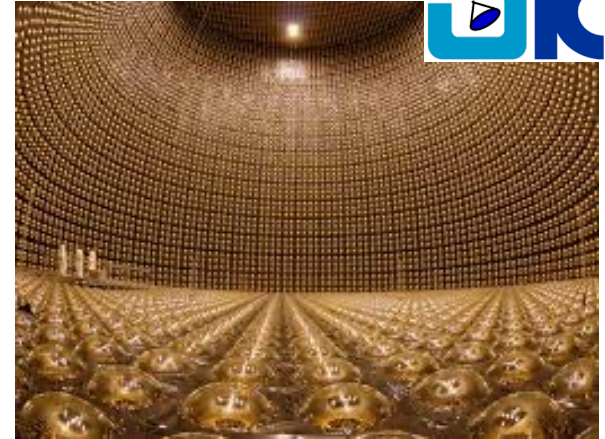
## University of Pisa (Dec 2022 ~)

- Early Stage Researcher

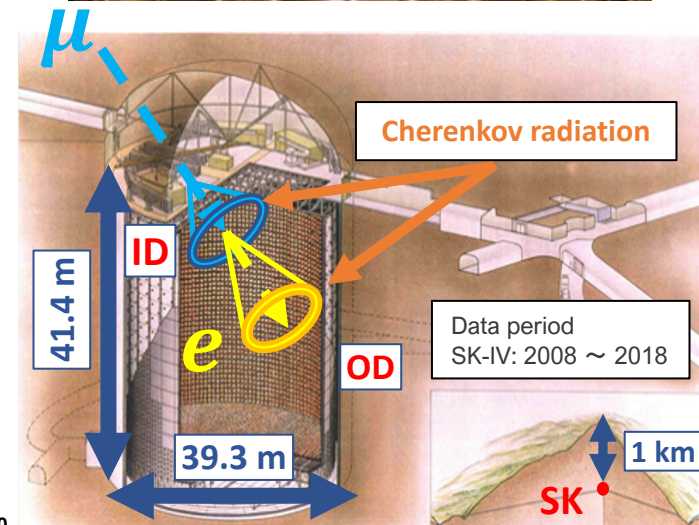
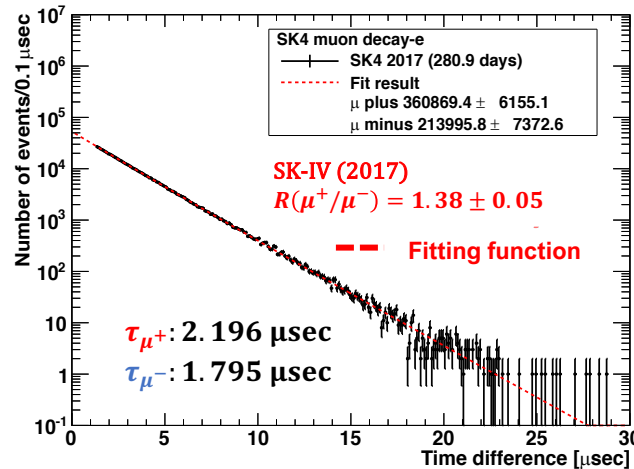
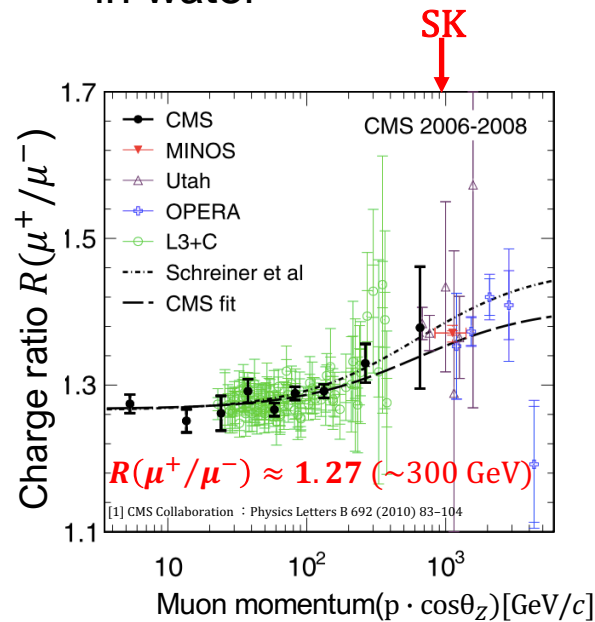
NA61/SHINE CERN(July 2022)



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



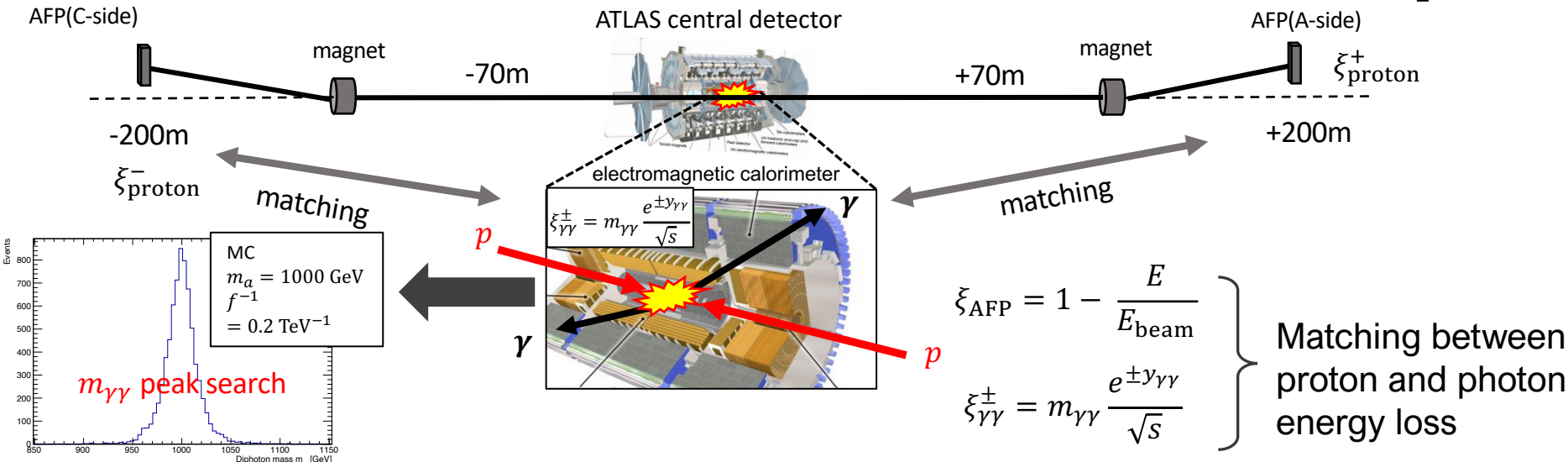
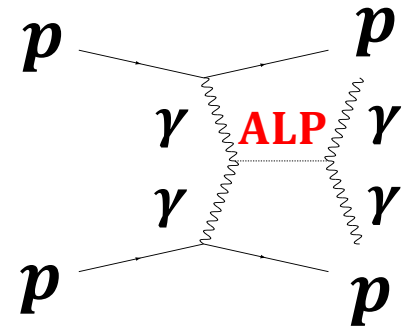
- Muon charge ratio  $R(\mu^+ / \mu^-)$
- precise estimation of **hadron productions** and the **atmospheric neutrino flux**
- search for  $\mu - e$  **decay candidates**
- counting total  $N_{\pm}$  considering lifetime  $\tau_{\mu^{\pm}}$  difference in water



## 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  $f^{-1}$



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- Optimization of diphoton acoplanarity selection cut for an ALP search in  $pp$  collision

