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MELBOURNE

Previous research

- University of Rome “Sapienza”:
 - Master degree (2011): “*Muon performance studies at the ATLAS experiment*”.



- University of Bonn:
 - PhD (2016): “*MSSM Higgs boson searches with tau leptons at ATLAS*”.



- Postdoctoral fellow at University of Melbourne:
 - 2015 - 2018:



- ATLAS searches for particles predicted by See-Saw mechanisms: doubly-charged Higgs, heavy neutrinos, heavy leptons.
 - ATLAS reconstruction + trigger software development.



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- 2019 - present:

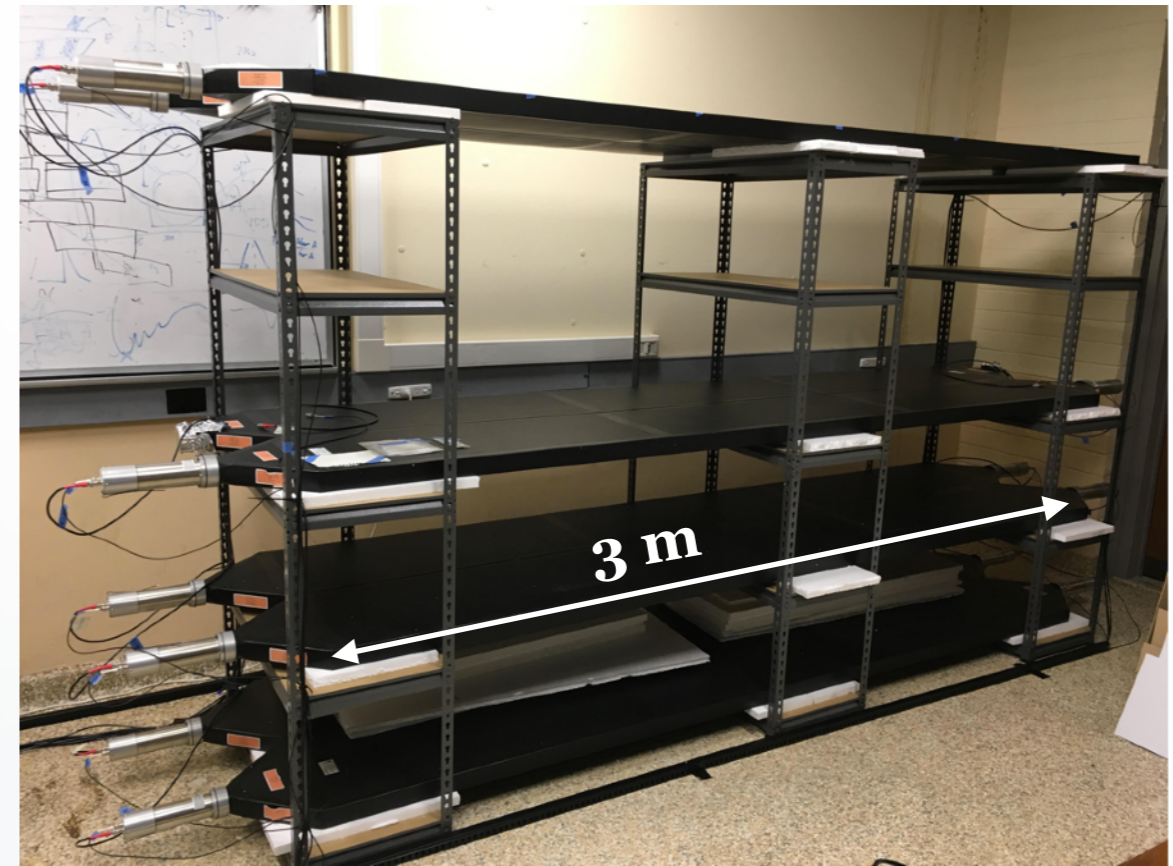


- SABRE muon detector commissioning.
 - Muon measurements @ SUPL.
 - Software coordination.

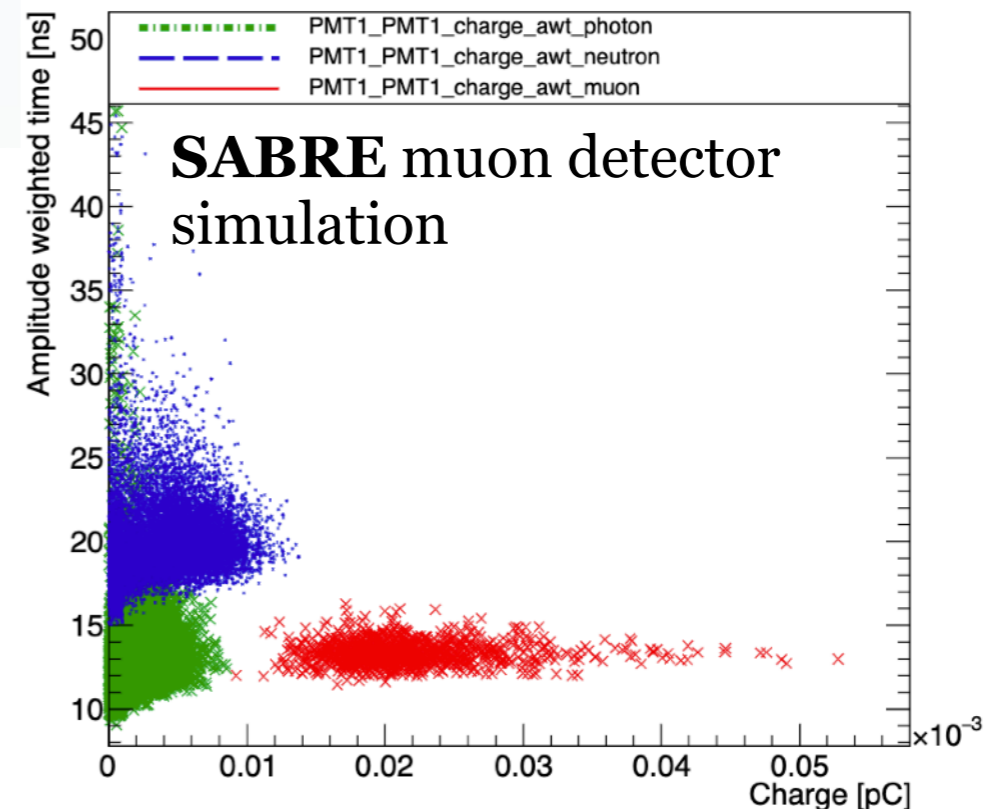
SABRE research interests

- Muon detector commissioning.
- Muons @ SUPL.
- Software architecture.
- Software environment.

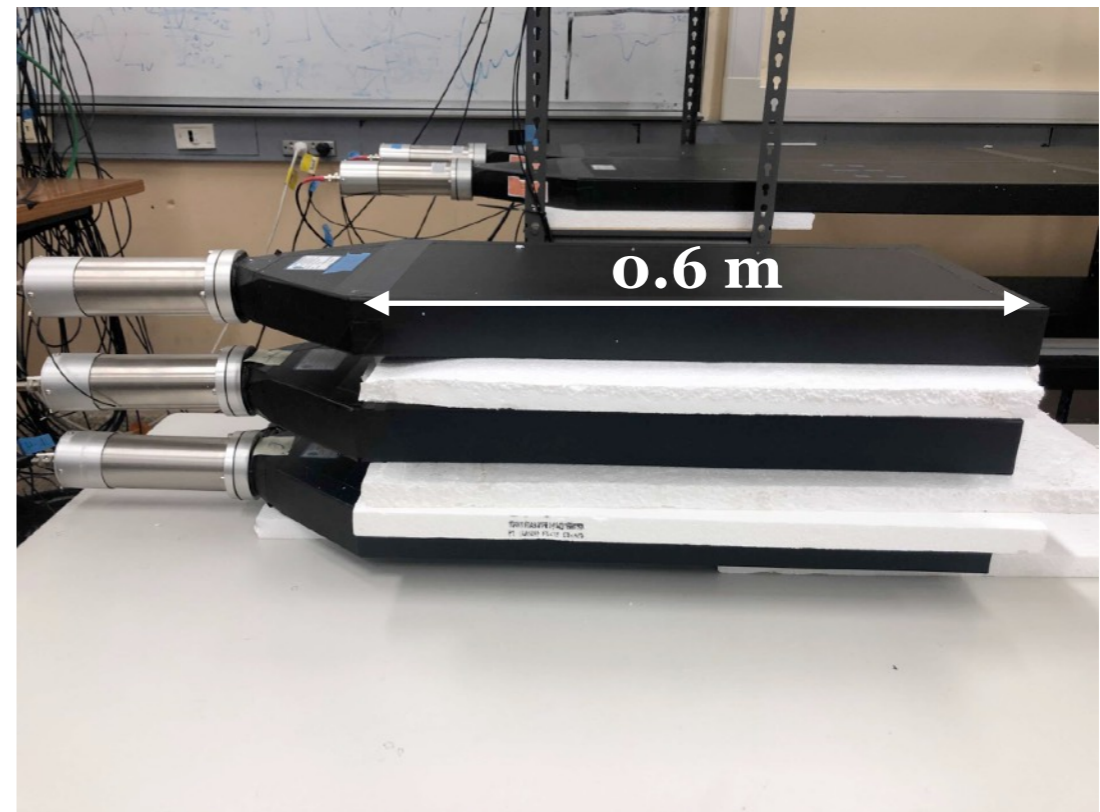
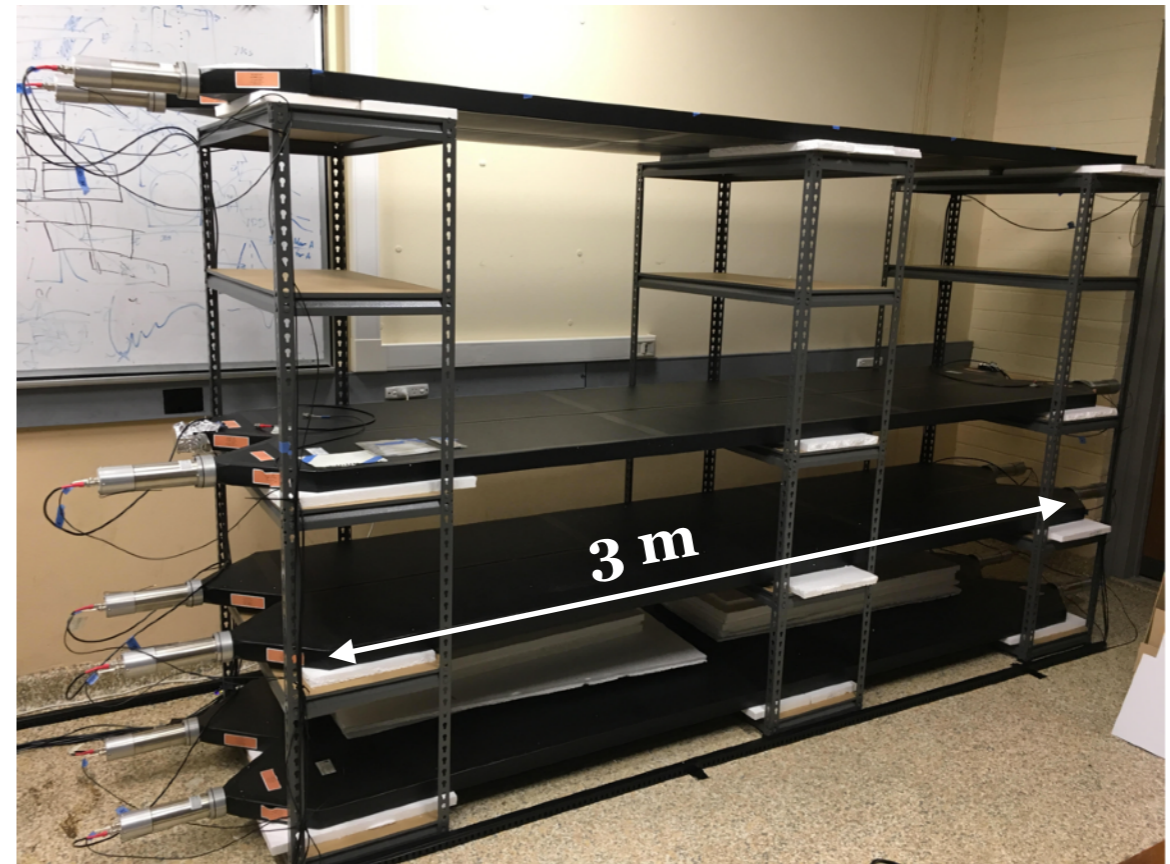
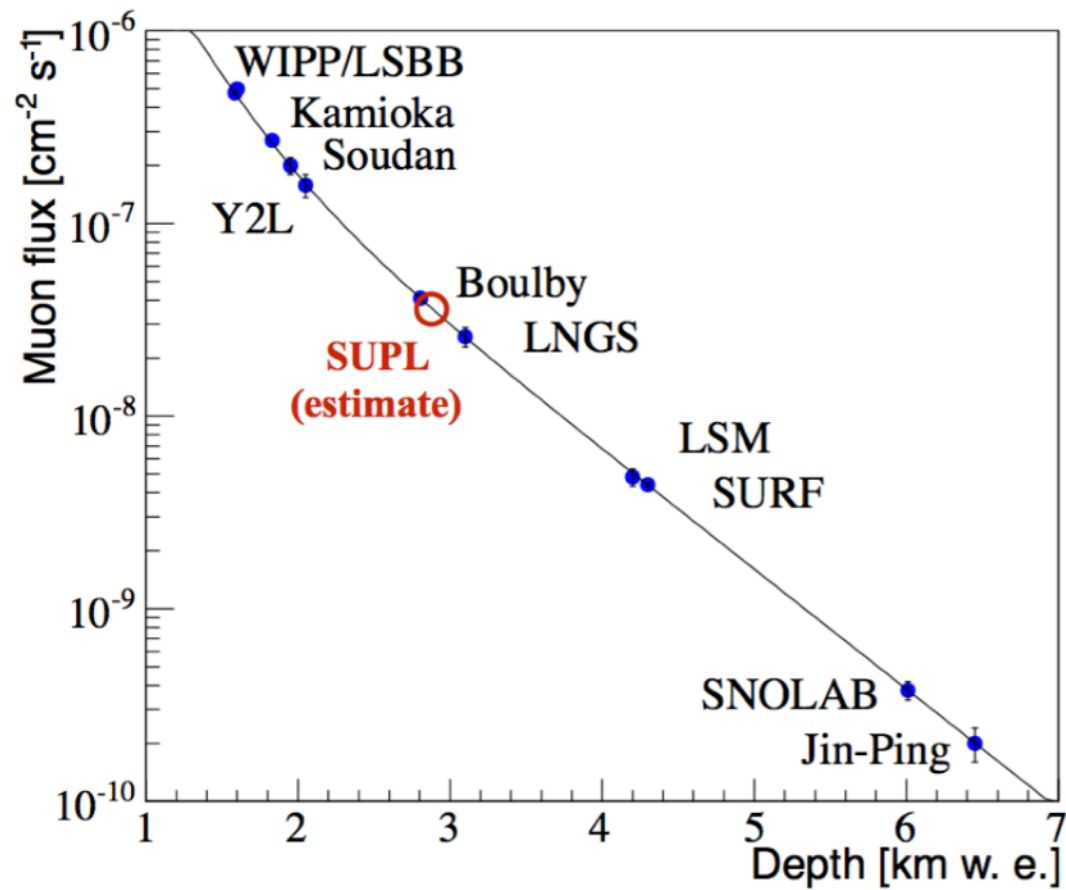
Muon detector commissioning



- Calibration and performance:
 - Signal coordinate based on PMT time difference.
- Pulse shape discrimination:
 - Handle on muons, neutrons and gammas.
- Muon detector simulation:
 - Realistic modelling of PMT pulses.



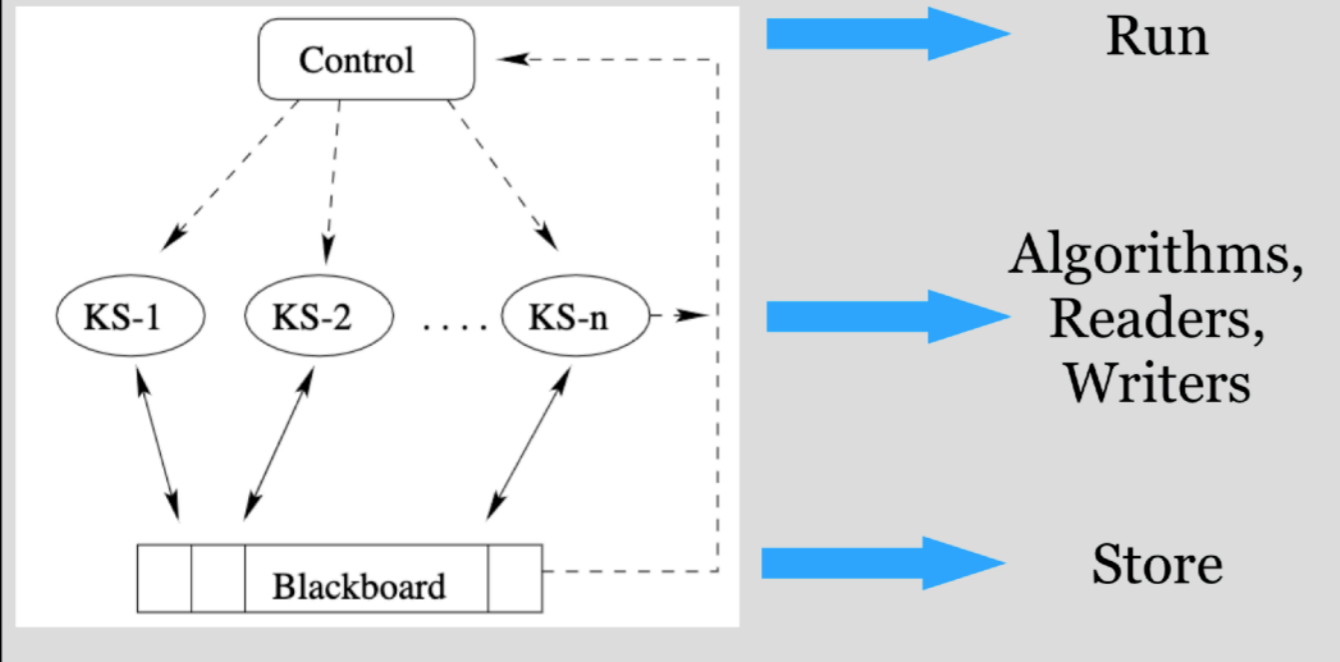
Muons @ SUPL



- Detector performance:
 - Preliminary studies with detector at the surface.
 - Study dead time, acceptance, efficiency.
- Muon flux measurement @ SUPL:
 - Magnitude.
 - Time dependence.
 - Angle dependence.

SABRE offline software architecture

Job

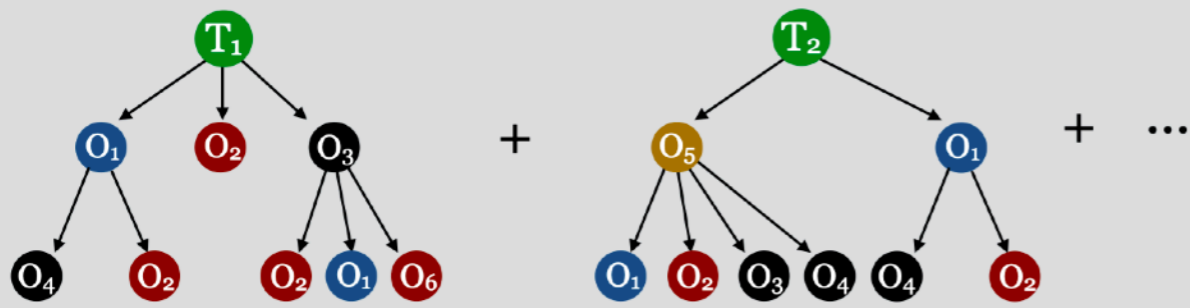


- Multi-purpose offline software:
 - [pyrate framework](#).
 - python-based.
- Aim to be used in general particle physics workflows.
- High modularity and reusability of algorithms.
- Easy to use at different levels of software experience.

Initialise: target loop in input loop

Execute: target loop in input+event loop

Finalise: target loop only



Store: *permanent* objects. Never cleared.
 Store: *transient* objects. Cleared after target loop.
 Store: *ready* objects. Cleared before finalising the target loop.

	Summer student	Master student	PhD student
<ul style="list-style-type: none"> • Modify configuration of objects and jobs. • Reusing existing algorithms. • python knowledge is not even required for this! 	✓	✓	✓
<ul style="list-style-type: none"> • Define algorithms for objects. • Define algorithms for targets (rare). 	✓	✓	✓
<ul style="list-style-type: none"> • Define Readers (rare). • Define Writers (rare). 	✗	✓	✓
<ul style="list-style-type: none"> • Maintenance. 	✗	✗	✓

Development of offline software environment

- **Data-preparation:**
 - Offline Event Builder.
 - Data-format transformations.
 - Data/simulation harmonisations.
- **Event Reconstruction:**
 - Pulse reconstruction.
 - Calculation of discriminating variables.
 - Application of calibrations.
 - Waveform digitisation for simulation, etc
- **Data analysis.**
 - Definition of variables.
 - Selection of events.
 - Plotting.

Projects /  SABRE /  SAB-22

Offline - data preparation

 Attach  Add a child issue  Link issue 

Description

Design strategy and implementation for data preparation. Full completion will require the development of the updated version of pyrate but design choices of the input/output structure can be made also with the current one. Notice that a branch has been assigned to this epic, **SAB-22-offline-data-preparation**, where all sub-branches assigned to child issues should converge.

Child issues

... +
50% Done

<input checked="" type="checkbox"/>	SAB-104 Define Event Data Model utilised for output ROOT ntuples	↑	IN PROGRESS
<input checked="" type="checkbox"/>	SAB-113 Support WaveDump input	↑	DONE
<input checked="" type="checkbox"/>	SAB-114 Support WaveCatcher input	↑	DONE
<input checked="" type="checkbox"/>	SAB-115 Support DataBase input	↑	DONE
<input checked="" type="checkbox"/>	SAB-116 Support binary data	↑	IN PROGRESS
<input checked="" type="checkbox"/>	SAB-118 Performance monitoring for data preparation	↑	IN PROGRESS



Linked issues

+

blocks

	SAB-13 Software Framework	↑	TO DO
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is blocked by

	SAB-24 Dev - pvrte 1.0	↑	 IN PROGRESS
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