



Federico Scutti
postdoctoral fellow
University of 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*”.



- Posdoctoral fellow at University of Melbourne:

- 2015 - 2018:



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



- 2019 - present:



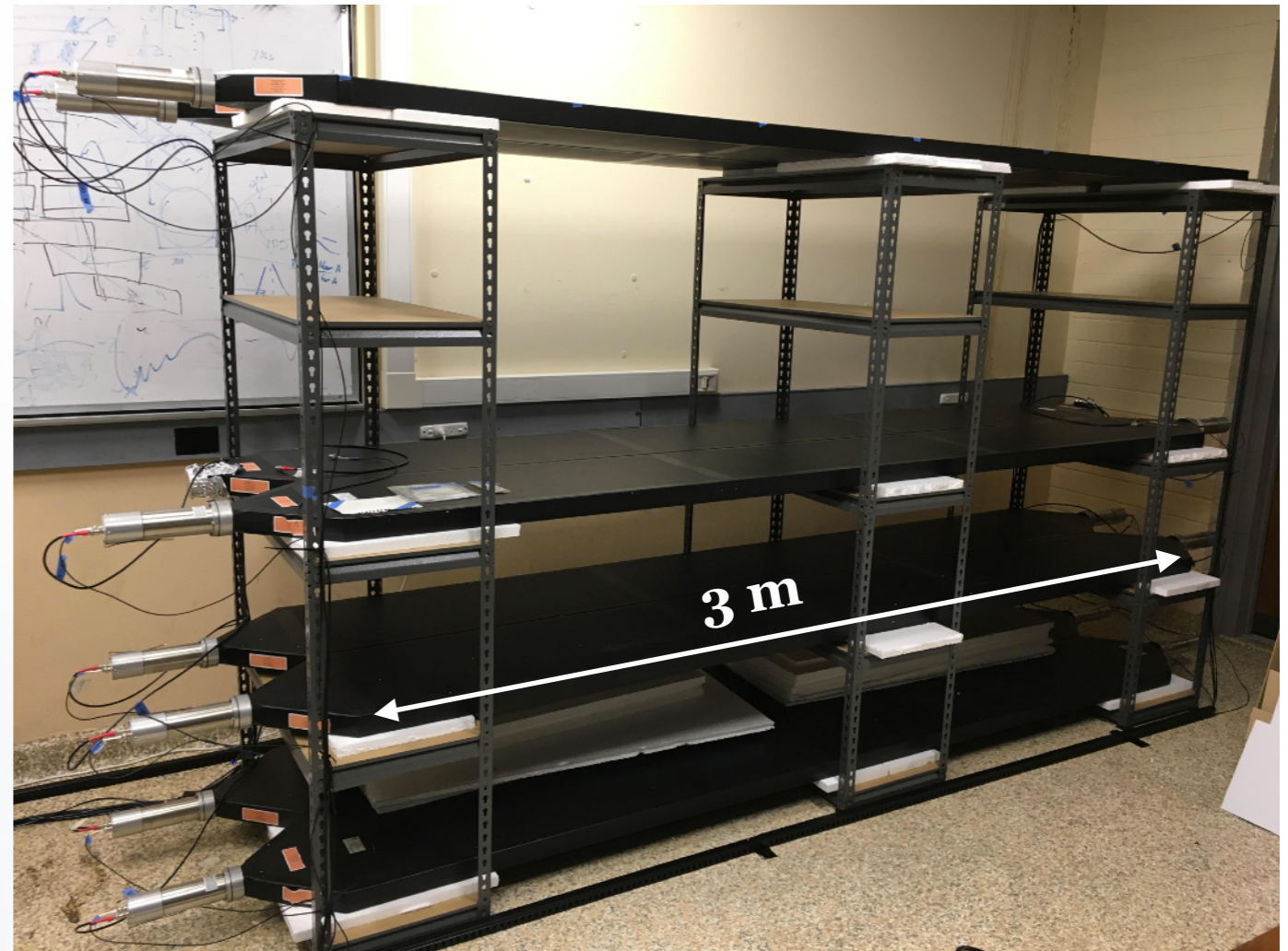
- SABRE muon detector commissioning.
- Muon measurements @ SUPL.
- Software design.

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SABRE research interests

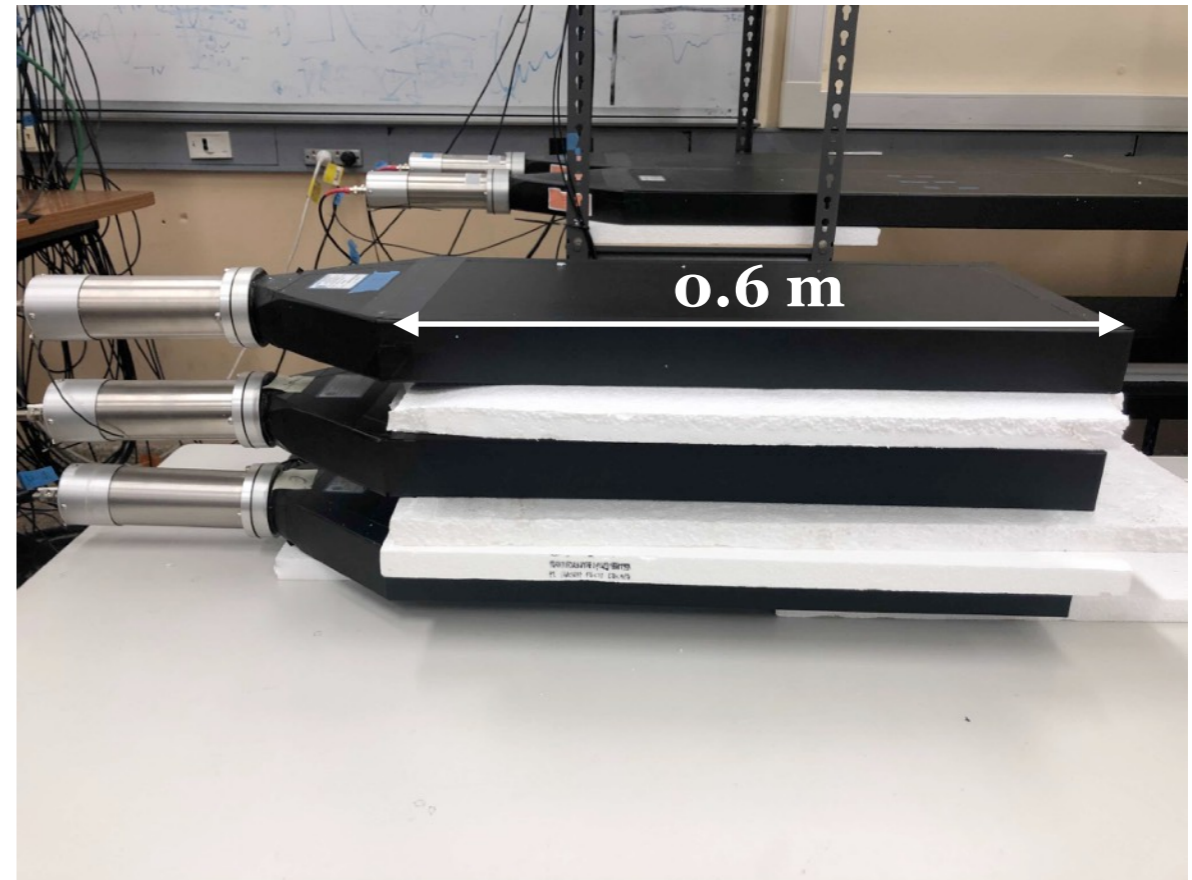
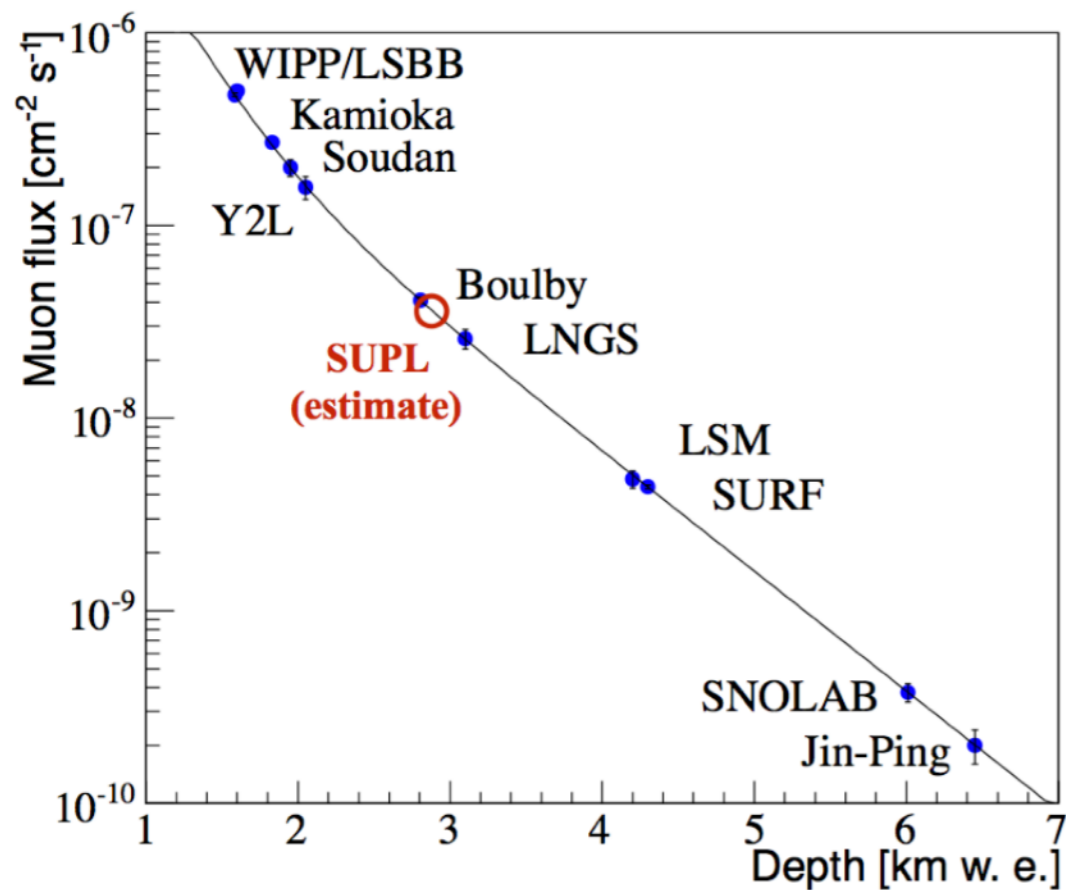
- Muon detector commissioning:
 - Detector calibration.
 - Pulse shape discrimination.
- Muons @ SUPL:
 - Muon flux measurement.
- Software architecture:
 - Offline software design.
- Software environment:
 - Offline signal/event reconstruction.
 - Harmonisation between offline and simulation.

Muon detector commissioning



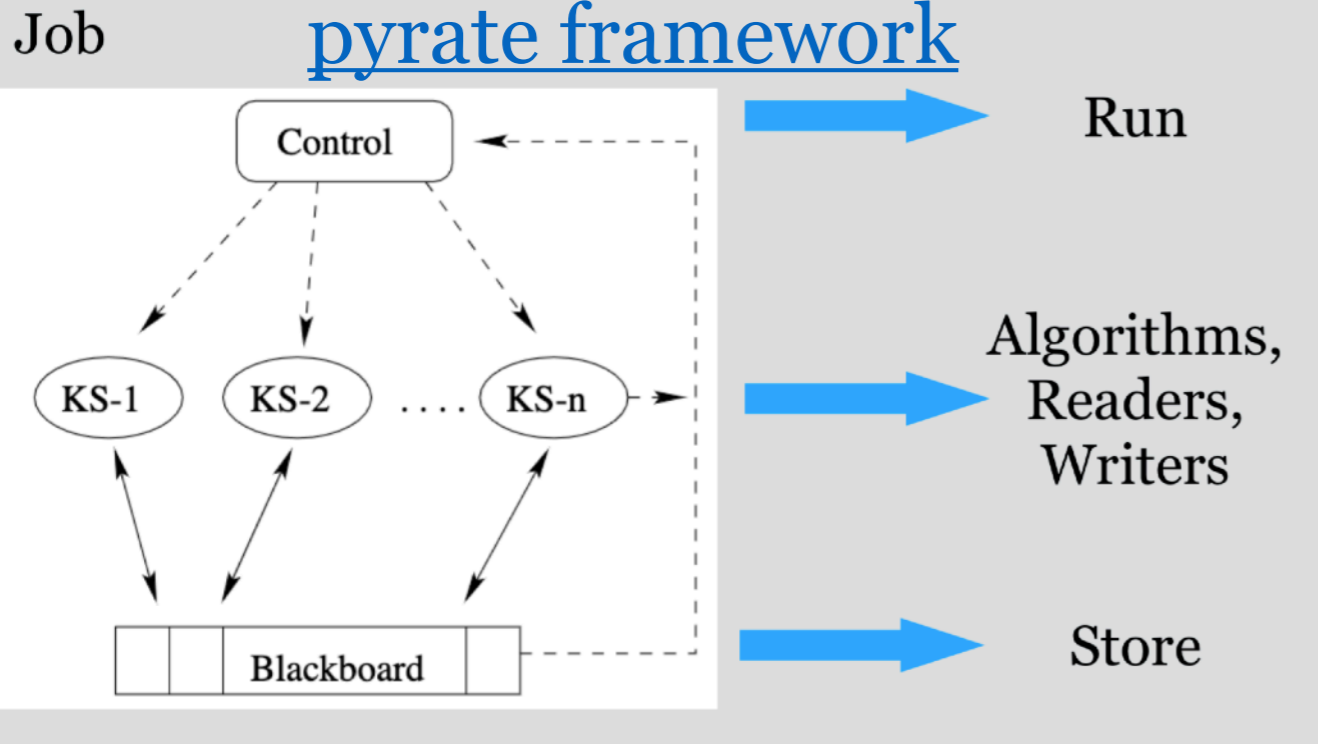
- Calibration:
 - Reconstruct signal coordinate based on PMT time difference.
- Pulse shape discrimination:
 - Handle on muons and neutrons.
 - Correlate signal with main SABRE detector one (time-of-flight).
- Muon detector simulation:
 - Realistic modelling of PMT pulses.

Muons @ SUPL



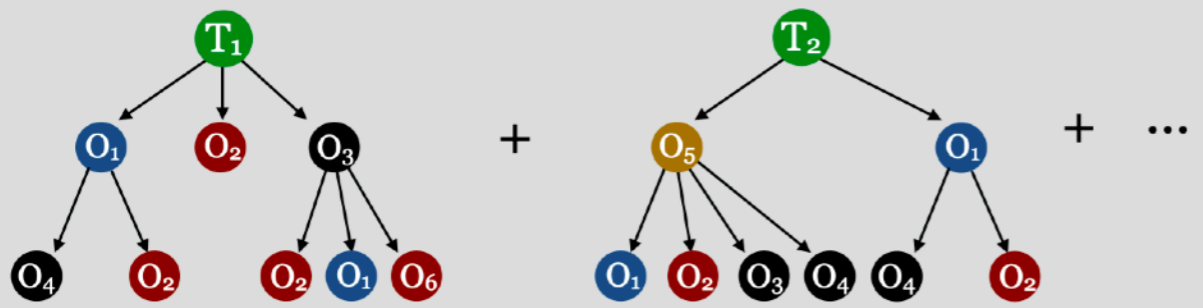
- Detector performance:
 - Preliminary studies with detector at the surface.
 - Study dead time, acceptance, efficiency.
- Muon flux measurement @ SUPL:
 - Magnitude.
 - Time dependence.

SABRE offline software architecture



- Initialise: **target** loop in input loop
- Execute: **target** loop in input+event loop
- Finalise: **target** loop only

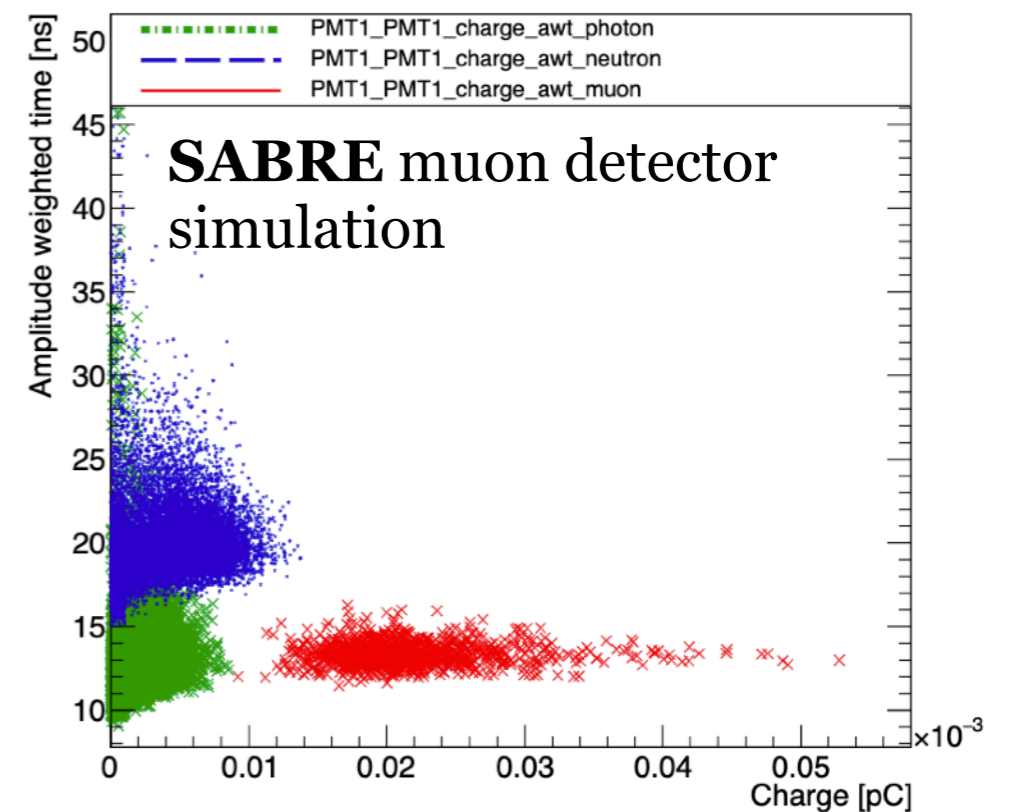
- Multi-purpose offline software:
 - python-based.
- High modularity and reusability of algorithms.
- Easy to use at different levels of software experience.
- Aim to be used in general particle physics workflows.



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

Development of offline software environment

- Data-preparation:
 - Offline Event Builder, data-format transformations, data/simulation harmonisations.
- Event Reconstruction/calibrations:
 - Pulse shape reconstruction, calculation of discriminating variables, application of calibrations, waveform digitisation for simulation, etc.
- Data analysis.
 - Definition of variables, selection of events, plotting.





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