Federico Scutti

postdoctoral fellow

University of Melbourne

Previous research

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

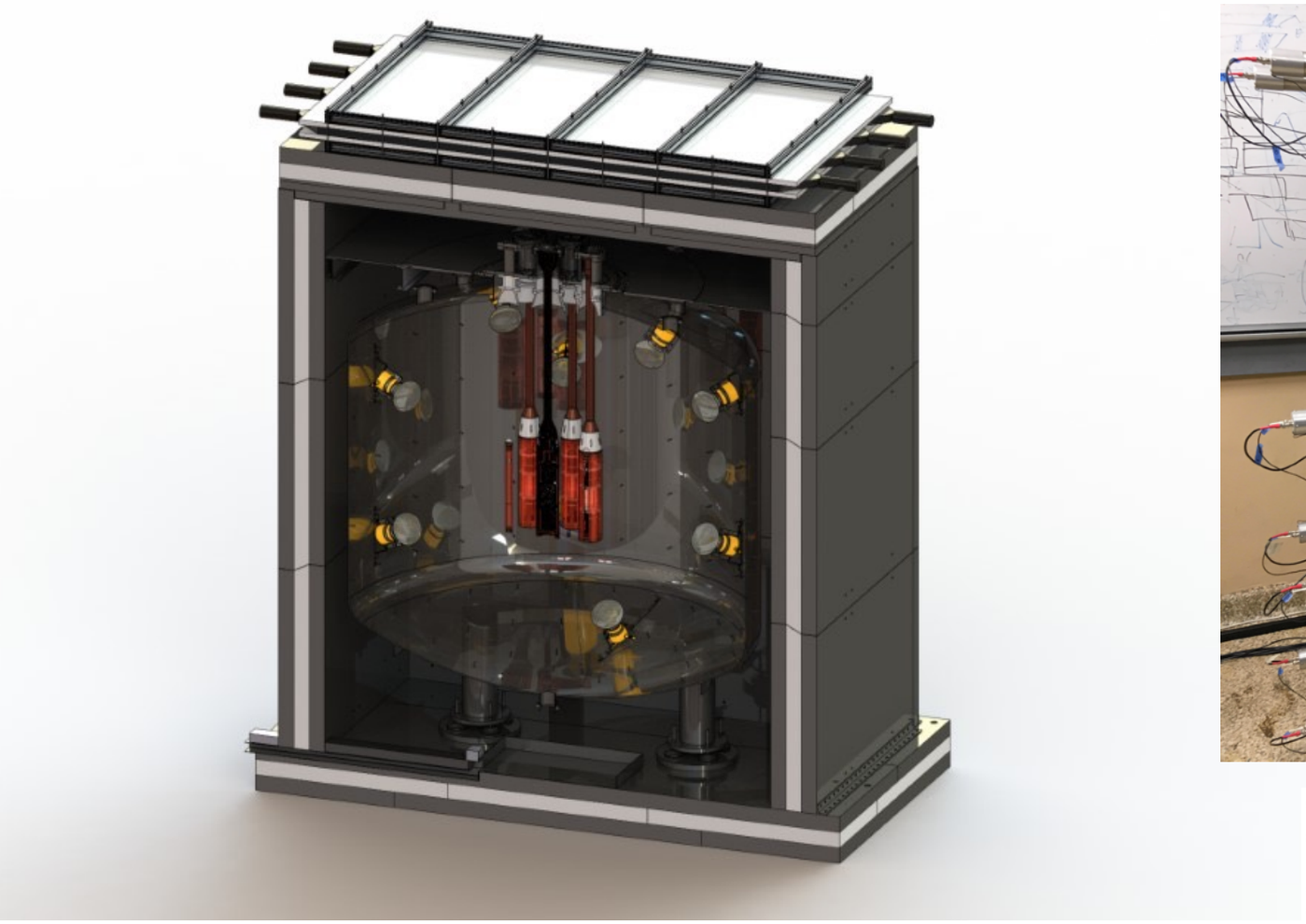
- University of Bonn:
  - PhD (2016): “*MSSM Higgs boson searches with tau leptons at ATLAS*”.

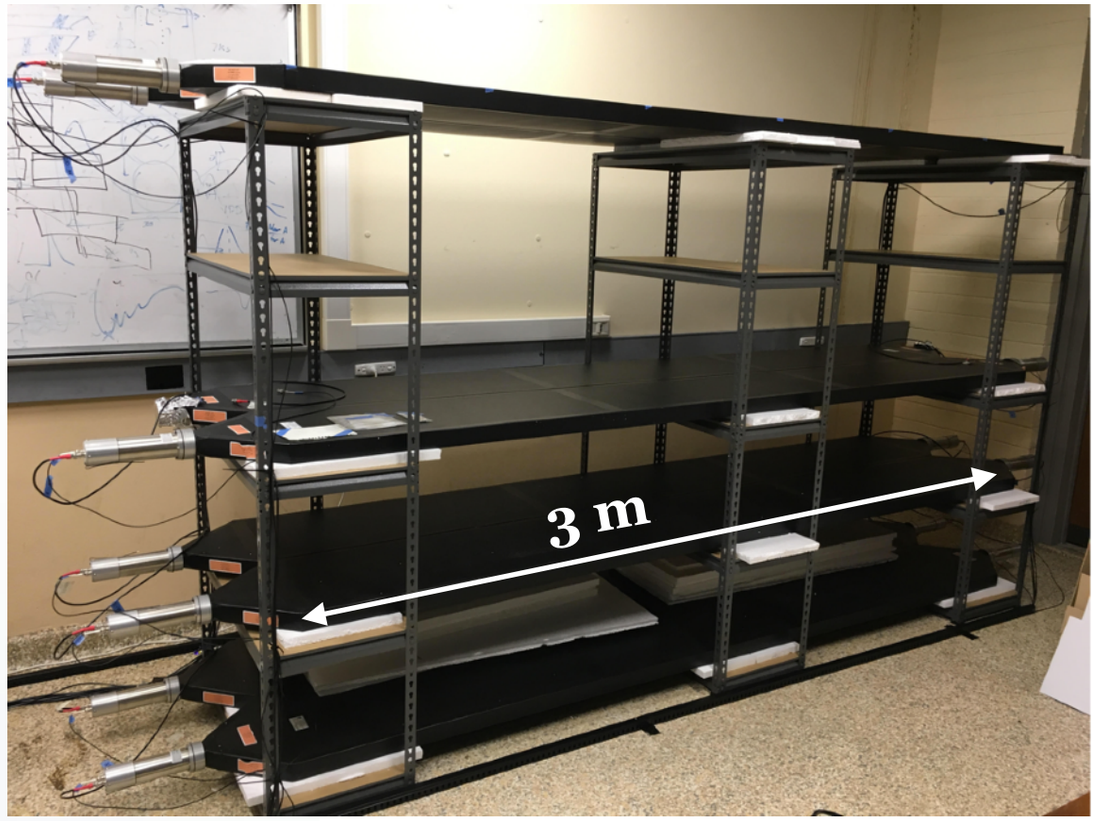
- Posdoctoral fellow at University of Melbourne:
  - 2015 - 2018:
    - ATLAS searches for particles predicted by See-Saw mechanisms: doubly-charged Higgs, heavy neutrinos, heavy leptons.
    - ATLAS reconstruction + trigger software development.
  - 2019 - present:
    - SABRE muon detector commissioning.
    - Muon measurements @ SUPL.
    - Software coordination.

SABRE research interests

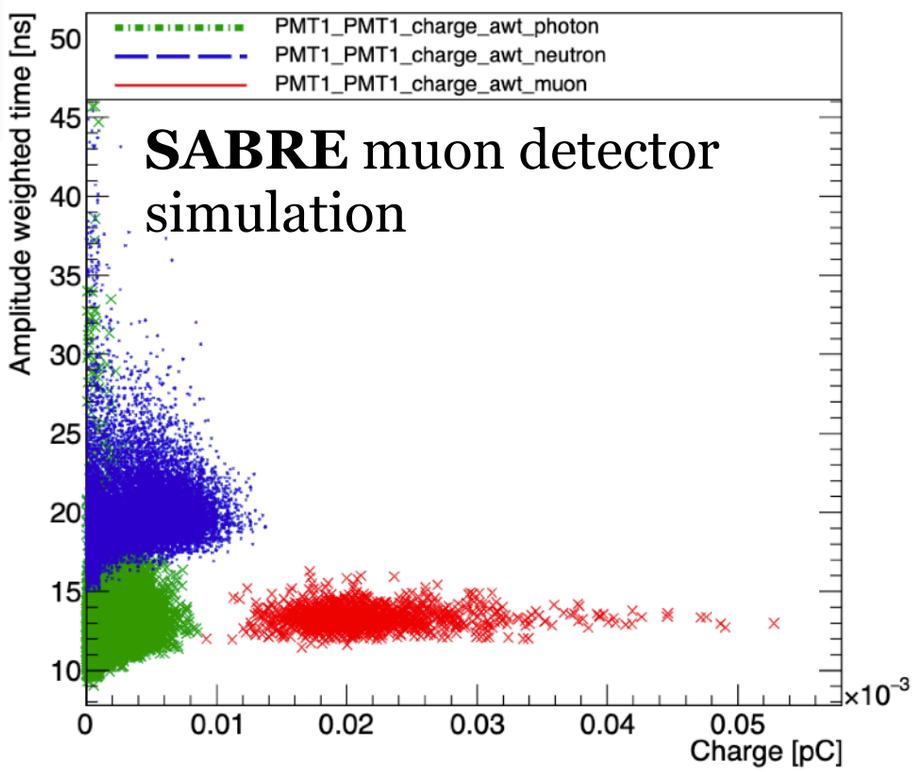
- Muon detector commissioning.
- Muons @ SUPL.
- Software architecture.
- Software environment.

Muon detector commissioning

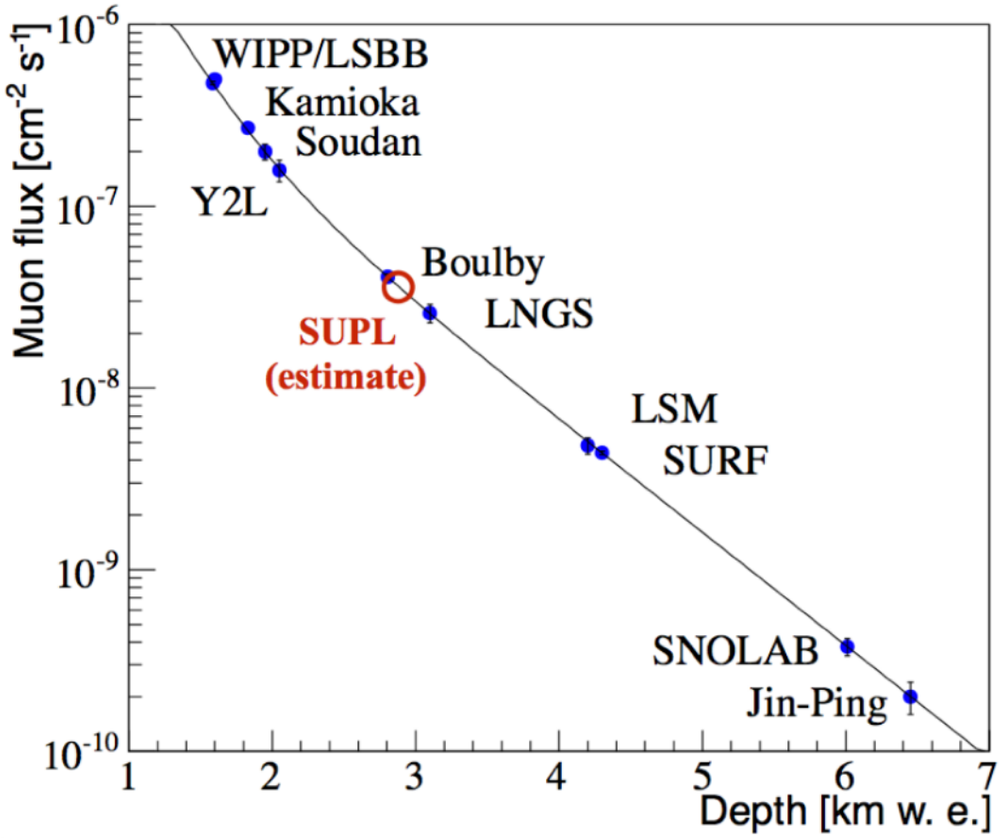


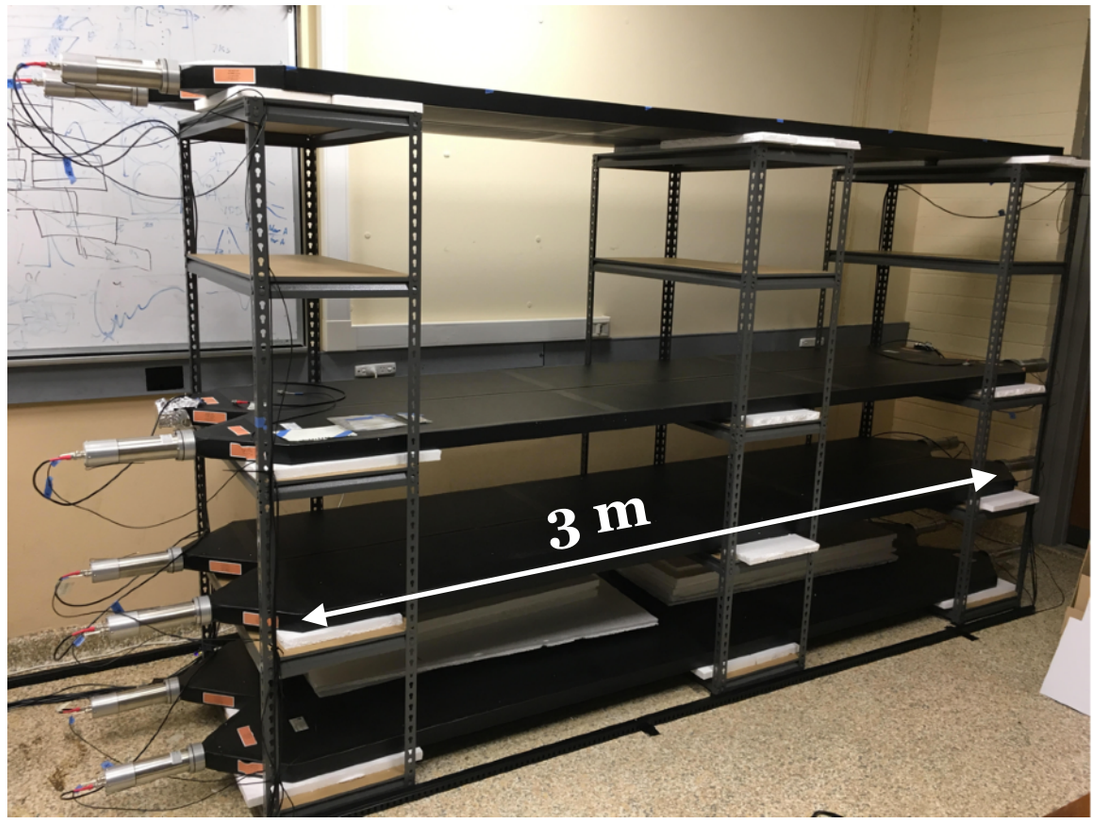


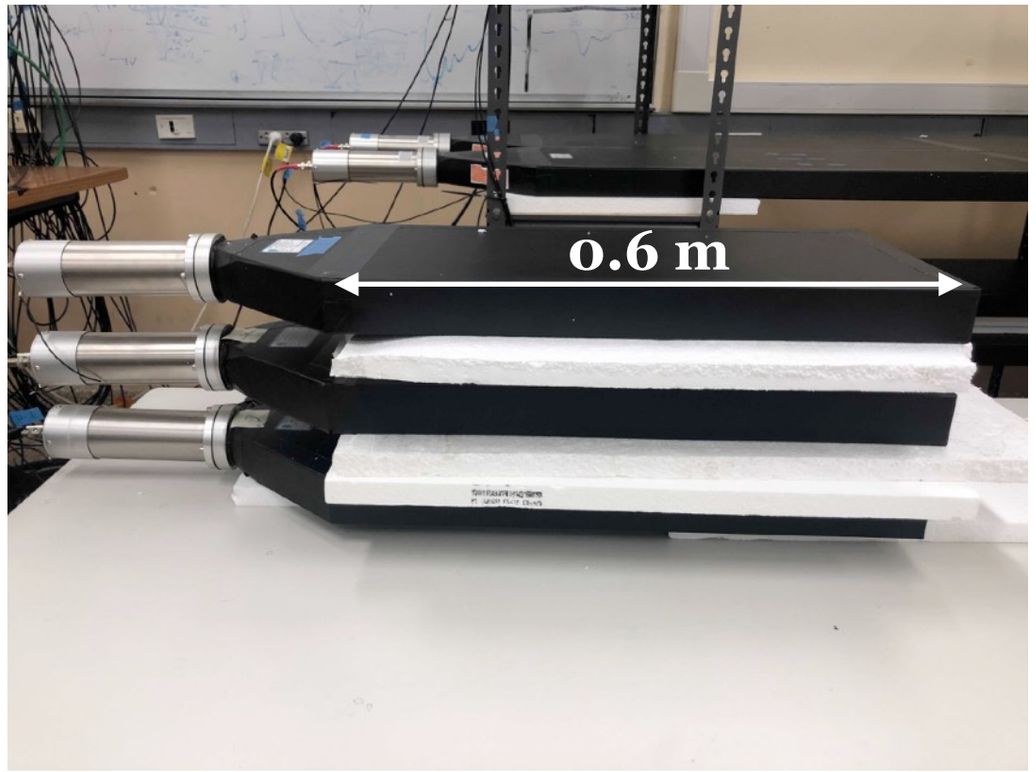
- Calibration and performance:
  - Signal coordinate based on PMT time difference.
- Pulse shape discrimination:
  - Handle on muons, neutrons and gammas.
- Muon detector simulation:
  - Realistic modelling of PMT pulses.



Muons @ SUPL

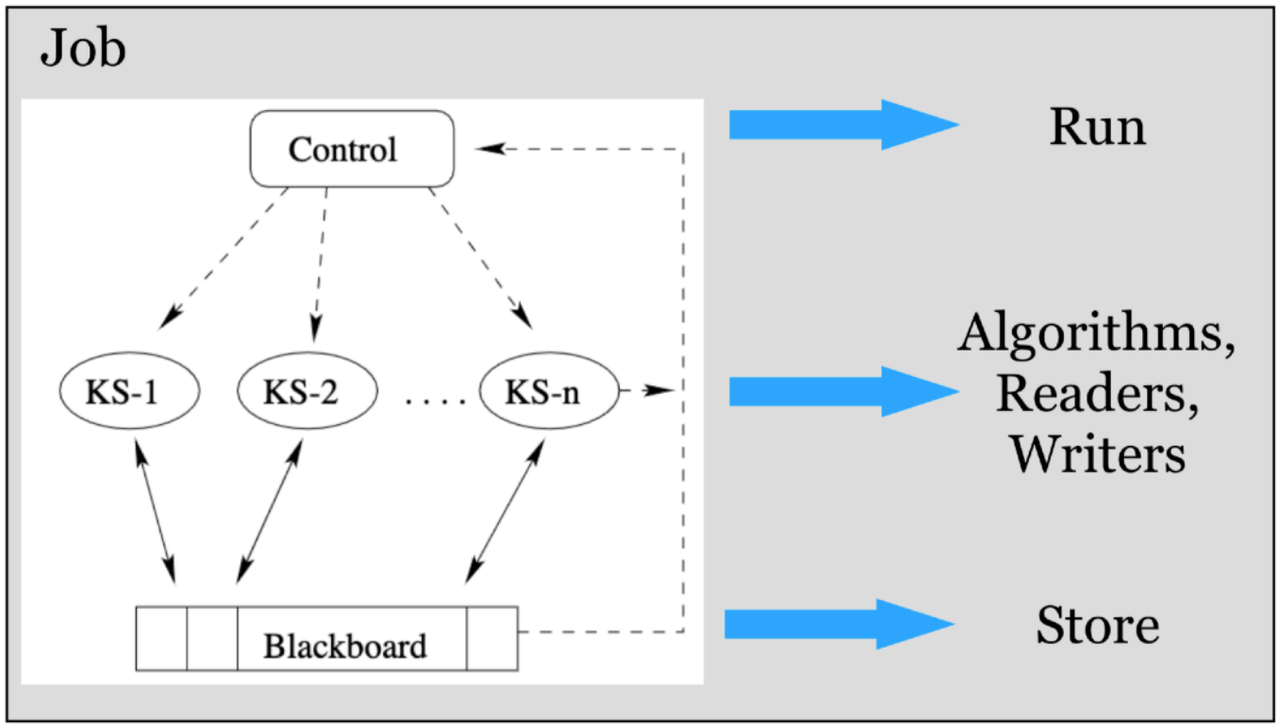






- Detector performance:
  - Preliminary studies with detector at the surface.
  - Study dead time, acceptance, efficiency.
- Muon flux measurement @ SUPL:
  - Magnitude.
  - Time dependence.
  - Angle dependence.

SABRE offline software architecture

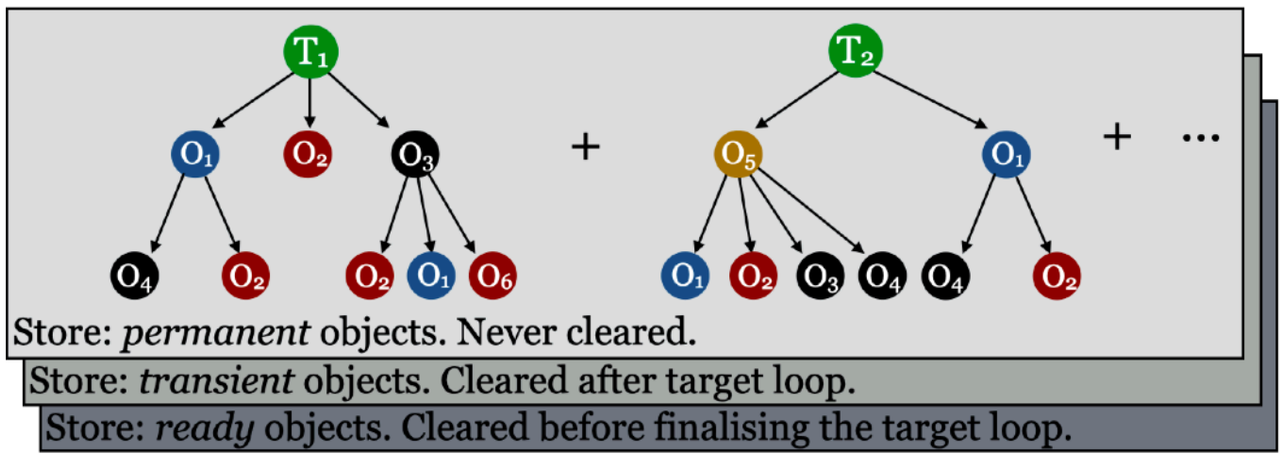


- Multi-purpose offline software:
  - **pyrate framework**.
  - python-based.
- Aim to be used in general particle physics workflows.
- High modularity and reusability of algorithms.
- Easy to use at different levels of software experience.

Initialise: **target** loop in input loop

Execute: **target** loop in input+event loop

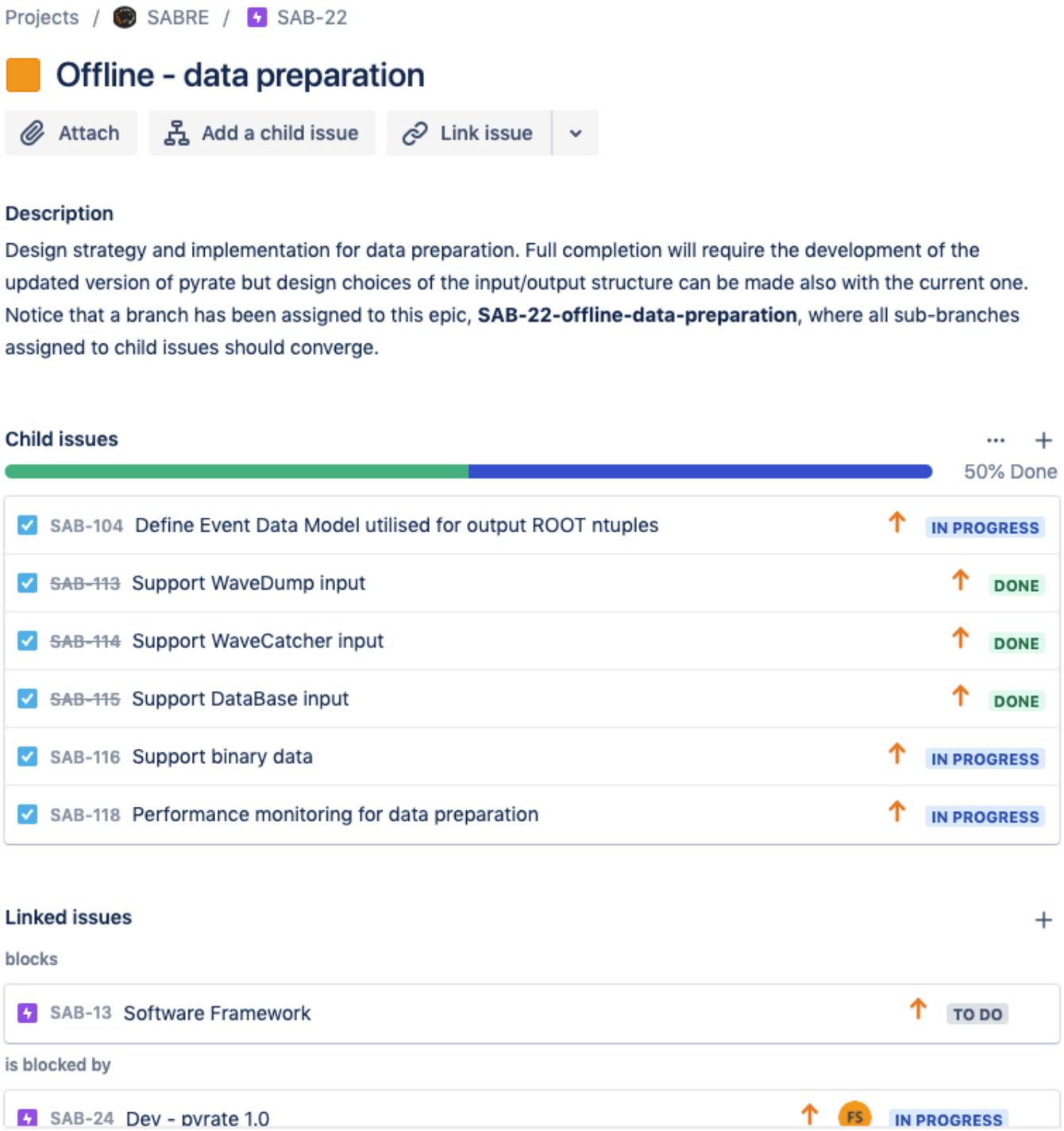
Finalise: **target** loop only



	Summer student	Master student	PhD student
• Modify configuration of objects and jobs. • Reusing existing algorithms. • python knowledge is not even required for this!	✓	✓	✓
• Define algorithms for objects. • Define algorithms for targets (rare).	✓	✓	✓
• Define Readers (rare). • Define Writers (rare).	✗	✓	✓
• 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.



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